evoted to
EXTILE
HEMISTRY
LEACHING
DYEING
RINTING
NISHING

EMBER 25, 1944
ME 33, No. 20

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AMERICAN

DYESTUFF REPORTER

IAL PUBLICATION
of the
ROCEEDINGS
CAN ASSOCIATION
EXTILE CHEMISTS
ND COLORISTS

A second line is drawn!

In the Diphenyl (Direct) color series a line has always been drawn between the group of ordinary commercial colors and the Diphenyl Fast Color series.

Now a second line has been drawn with the establishment of the Solophenyl series -- the fastest to light of all the Geigy Diphenyl colors for Cotton and Rayon.

For only the fastest colors can comply with the high standards set for the Solophenyl Colors.

Solophenyl Colors:

Yellow FFL Supra
Orange TGL
Orange 2RL
Bordeaux 2BL
Violet 2RL
Blue 3RL
Blue FGL
Blue 10GL
Blue Green BL
Green GL
Olive GL Extra
Brown GL
Brown RL
Brown BGL Extra
Grey 4GL

Color Card 318-D illustrates present range of Solophenyl Colors.

GEIGY COMPANY, INC.

99-91 BARCLAY STREET — NEW YORK — NEW YORK

Boston · Providence
Philadelphia · Charlotte
Toronto · Portland, Ore.

Geigy
Dyestuff Makers Since 1859

In Great Britain
The Geigy Colour Co., Ltd.
National Buildings
Parsonage, Manchester

Use DECERESOL* OT

THE MOST POWERFUL WETTING AGENT AVAILABLE

DECERESOL OT saves time and increases efficiency in dozens of applications where speed and thoroughness in wetting are necessary. Following is a partial list of applications in which DECERESOL OT has proven its time and trouble saving powers:

Wetting out cotton piece goods prior to "grey souring."

Wetting out raw cotton in raw stock dyeing machines.

As a penetrant in all types of dyeing including yarn and knitted and woven goods.

As a dispersing agent in the pigment method of vat dyeing.

For rapid wetting out in sanforizing.

For wetting out grey goods prior to kier boiling to insure more uniform boil off and to prevent resist marks in subsequent dyeing.

As a dispersing agent in dyestuff mixtures to insure better solubility and to improve color value.

As a dispersing agent for finishing oils to obtain greater softening value.

In desizing baths with enzymes to produce more rapid and efficient desizing.

For boiling off rayons and acetates.

In the woolen and worsted industry as an aid in fulling and carbonizing.

For dyeing Nylon and Vinyon yarns, hosiery, etc.

For the production of highly absorbent products such as mop yarns, paper mill felts, towels and similar fabrics.

An hour saved is an hour gained—and time is at a premium in textile processing today. If you are looking for ways to telescope more hours into your working day, ask our technical representative to help you put DECERESOL CT to work for you.

AMERICAN CYANAMID
& CHEMICAL CORPORATION
(A Unit of American Cyanamid Company)
30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

MANUFACTURERS OF
SULPHONATED OILS • PENETRANTS • SOFTENERS
FINISHES • SIZING COMPOUNDS • DECERESOL* OT
WETTING AGENTS AND OTHER SPECIALTIES FOR THE TEXTILE INDUSTRY.

Reg. U. S. Pat. Off.

American Dyestuff Reporter, Vol. 33, No. 20. September 25, 1944. Published every other Monday. Copyright 1944, by Howes Publishing Co., 440 4th Ave. New York, 16, N. Y. Domestic subscriptions, $5.00; Canadian, $6.00; Foreign, $6.00. Entered as second-class matter, Nov. 6, 1919, at the New York, N. Y. Post Office, under the act of March 3, 1879.

DIAZO FAST GREEN BL
DIAZO FAST BLUE 6GW CONC.

★

. . . for those special orders

requiring something different in shade — and something better in fastness.

Both the *Green* and the *Blue* are developed with Beta Naphthol to shades possessing developed color wash fastness *plus* excellent light fastness.

Diazo Fast Green BL is an unusual bluish Green that reserves Acetate, but is not suitable for discharge.

Diazo Fast Blue 6GW Conc is a clean, bright Blue dischargeable to a pure white both neutral and alkaline.

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IMPORTANT FACTS ABOUT S/V FINISHING OILS...

Now Available for Warp Sizing... Excellent Softening Effect... More Economical than Others!

THESE high-quality S/V Finishing Oils are in use now on many applications, including warp sizing, plain softening, starching and the treatment of cotton cloth before Sanforizing or pre-shrinking.

Uniformly high in quality, they provide excellent softening effect. They're easily applied, free from undesirable odor and discoloration and compatible with most starches, gums and other finishing materials.

With the wide range of these oils, individual mills can obtain exact desired finishes. Your Socony-Vacuum representative will be glad to give you full details.

GET THE FACTS ABOUT ALL THESE PROCESS PRODUCTS FOR TEXTILE MILLS

S/V WOOLREX OILS: Self-emulsifying wool oils. Excellent qualities for carding, spinning and scouring.

S/V FABRISEC AA AND MP: Highly concentrated. Provide maximum water repellency with minimum amounts.

S/V WORSTEX OIL: Self-emulsifying oil, resistant to oxidation and easily scoured. Recommended for French-type worsted weaving yarns.

S/V RAYON SOAKING OILS: Used with gelatins and glues for soaking viscose, other rayon yarns.

S/V FIBRE OIL A: Particularly adaptable for batching cordage fibre. (Jute, sisal, hemp, etc.)

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Standard Oil of New York Division • White Star Division
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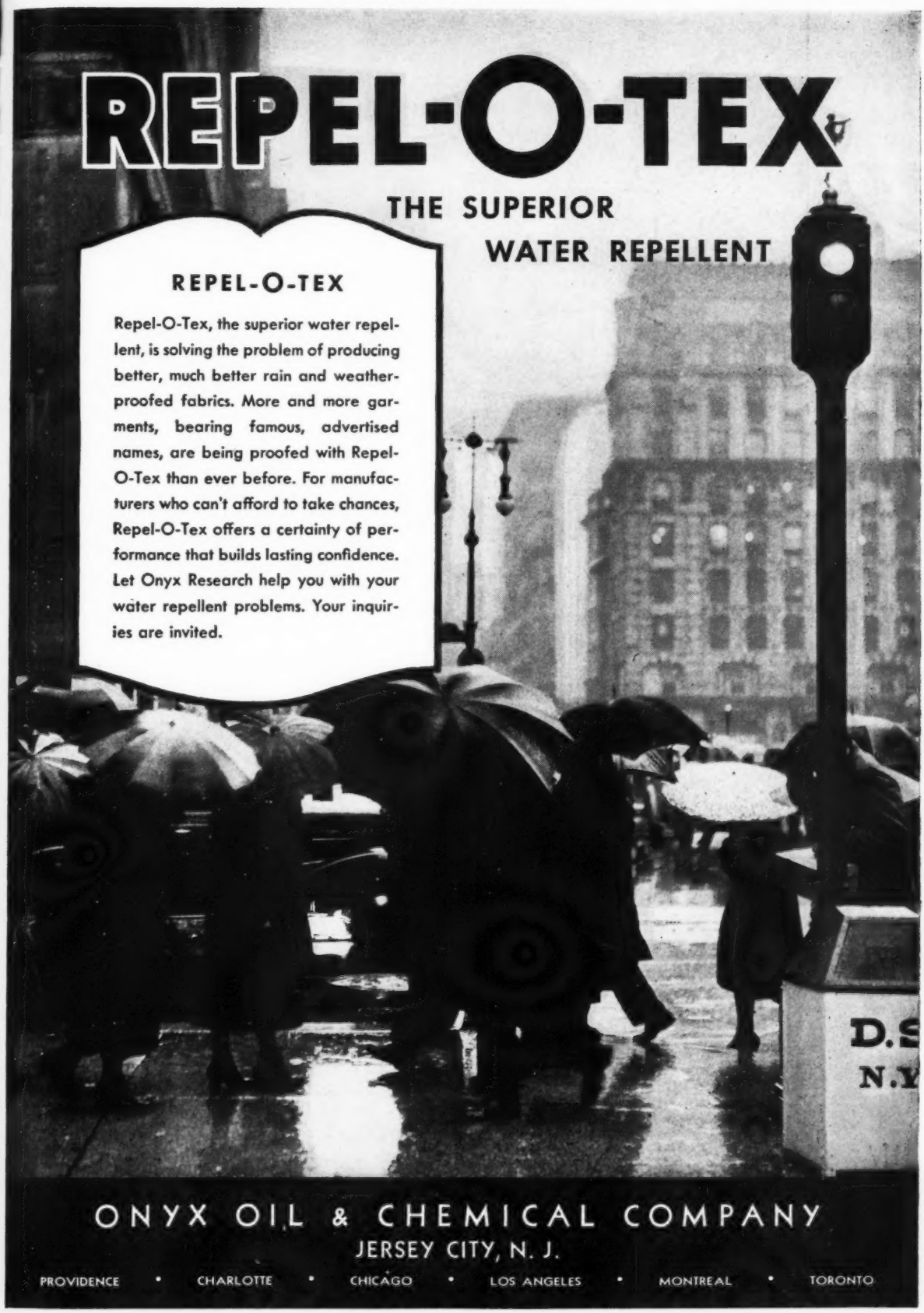
Wadhams Division • Magnolia Petroleum Company
General Petroleum Corporation of California

These products available subject to national wartime requirements


REPEL-O-TEX
THE SUPERIOR
WATER REPELLENT
REPEL-O-TEX
Repel-O-Tex, the superior water repellent, is solving the problem of producing better, much better rain and weather-proofed fabrics. More and more garments, bearing famous, advertised names, are being proofed with Repel-O-Tex than ever before. For manufacturers who can't afford to take chances, Repel-O-Tex offers a certainty of performance that builds lasting confidence. Let Onyx Research help you with your water repellent problems. Your inquiries are invited.
ONYX OIL & CHEMICAL COMPANY
JERSEY CITY, N. J.
PROVIDENCE • CHARLOTTE • CHICAGO • LOS ANGELES • MONTREAL • TORONTO

The greatness of Duse lay in her versatility . . .

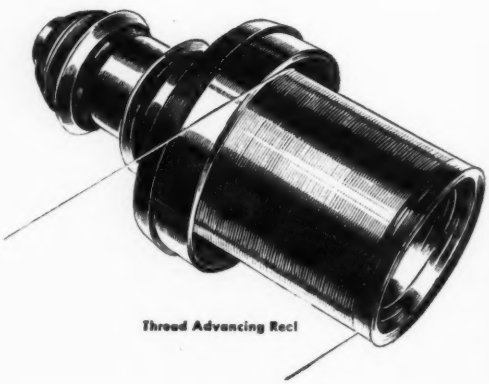
From tragedy to comedy and miraculous in either.

The greatness of INDUSTRIAL'S "Continuous Process" *Spun-lo Rayon Yarn lies in its versatility, too.

It is the thread advancing reels which make possible Industrial's amazing "Continuous Process" for producing *Spun-lo rayon yarn, and which give it its remarkable versatility.

Equally at home with yarn of deniers heavy enough for tire cord, or fine enough for cobweb fabric, the extreme uniformity of the yarn, cone by cone, lot by lot, and the absence of knots and broken filaments, are characteristics of the *Spun-lo "Continuous Process" common to every size yarn produced by it.

Of course, a very large part of our production continues to be used for vital war needs and the available yarn for textile purposes is insufficient to even partially take care of our regular customers' requirements. Still, we think it will pay you, in connection with your postwar textile planning, to get acquainted now with the possibilities and superiorities of *Spun-lo rayon yarn produced by the "Continuous Process".



Thread Advancing Reel

*Reg. U. S. Pat. Off.

Industrial RAYON CORPORATION MAKERS OF *Spun-lo RAYON YARN BY THE

CLEVELAND, OHIO • NEW YORK OFFICE, 500 FIFTH AVENUE

"The tide has turned and free men of the world are marching together to victory."

GDC DYESTUFFS ARE IN SERVICE ALL OVER THE WORLD

GENERAL DYESTUFF CORPORATION

NOPCO feels that the Society of American Textile Chemists and Colorists rates an orchid for each of its 22 years of progress and achievement. Our heartiest congratulations to the Society on the eve of its National Meeting at Atlantic City.

NOPCO appreciates the significance of the Society's intention to place the chief emphasis on the technical program. It is an indication that the Society is keenly aware of the role that farsighted planning and research must play in the solution of wartime and postwar problems.

A program of this type especially appeals to NOPCO, since it reflects the planning and research by which we constantly strive to improve and expand our services to the textile, chemical and allied industries.

NOPCO

NATIONAL OIL PRODUCTS COMPANY • HARRISON, N. J.
BOSTON • CHICAGO • CEDARTOWN, GA. • RICHMOND, CALIF.

You Can Always Figure on . . . FINE FABRIC FIGURES with KELTEX

Fine work, done fast — that's what printeries everywhere are finding with the use of KELTEX, the modern thickening agent.

Among the results you get from the use of KELTEX are:

EXCELLENT COLOR YIELD . . . SPLENDID PENETRATION . . . QUICK, EASY REMOVAL WITH LIGHT RINSE . . . NO SCRATCHING OR MARK-OFF IN WATER . . . LOW COST PER UNIT OF FINISHED GOODS.

KELTEX is easy to handle—simple to use—uniform! Convince yourself. Try KELTEX.

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REG. U. S. PAT. OFF.
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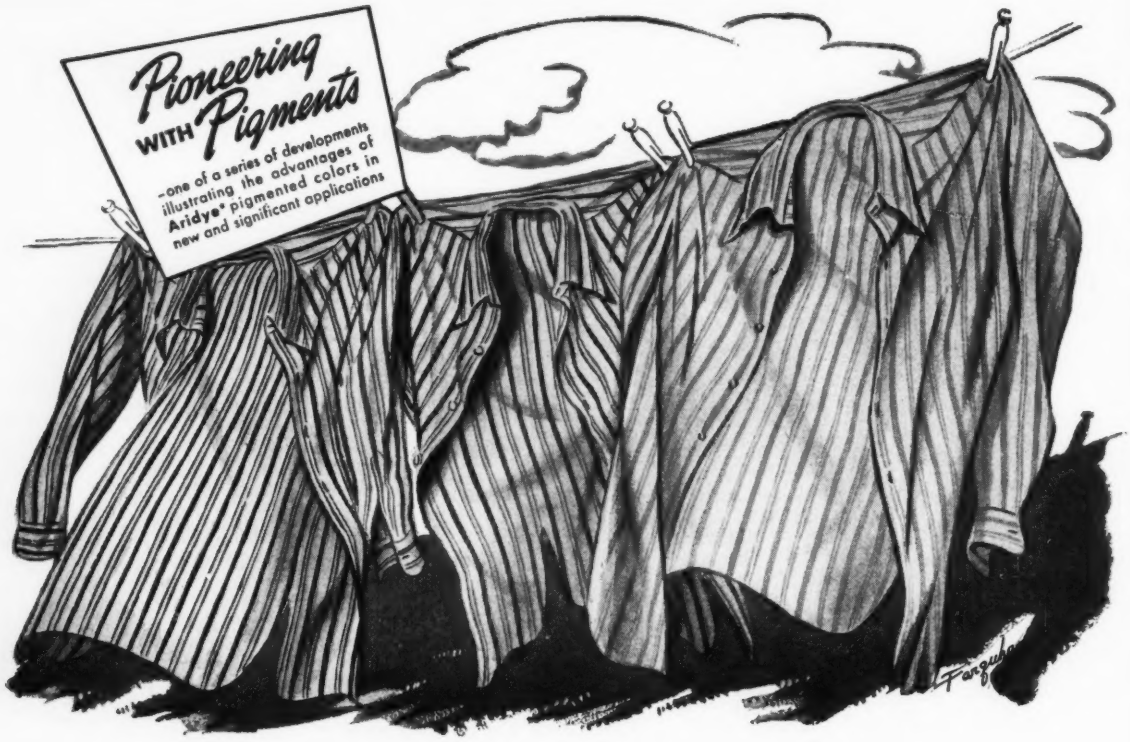
Pioneering
WITH Pigments
-one of a series of developments illustrating the advantages of Aridye* pigmented colors in new and significant applications

Full Shade or Light Tints

EVEN WHEN REDUCED TO TINTS, SELECTED ARIDYE COLORS HAVE *EXTREME LIGHT FASTNESS*

Light fastness is one of the outstanding advantages of Aridye pigment-printing colors. Most pigments are reasonably lightfast. For those uses where light fastness is *extremely* important, certain Aridye colors may be selected which, even in light tints, will withstand 300 fadeometer hours without let down!

In wash fastness, Aridye colors meet or exceed accepted standards of the textile industry. By careful selection of technically correct pigments and binders, Aridye colors have been formulated to bond with textile fibers so firmly that they pass the most severe Launderometer and scrub tests.

Application problems are simplified by the use of Aridye colors. Matching is easier and quicker because the colorist is working with fully developed colors; and, because Aridye colors wet quickly both fibers and the metal of the engraving, they assure a sharp, uniform mark that is an *exact* reproduction of the engraving.

A wide range of Aridye colors can be supplied under M-103. In addition, 13 extremely lightfast Aridye colors are still available without any restrictions. For complete information about Aridye pigment-printing colors and the advantages they offer you, write today to Aridye Corporation, a subsidiary of Interchemical Corporation, Fair Lawn, New Jersey.

NOT 1, NOT 2, BUT 3 CONDITIONS
Govern The Bond Between Fabric Fiber and Pigment

1. **Technically correct pigment colors**
2. **Proper application to the fibers**
3. **Adequate curing of the fabric**

No Shortcut Procedure Can Produce A Satisfactory Bond

*Reg. U. S. Pat. Off.

Aridye TEXTILE COLORING MATERIALS

ARIDYE CORPORATION • SUBSIDIARY OF INTERCHEMICAL CORPORATION • FAIR LAWN, N. J. • ROCK HILL, S. C. • PROVIDENCE, R. I.

PIN-UP PICTURE for Caustic Soda Users

Latest contribution to safeguarding Westvaco quality and service to Caustic Soda customers is the fleet of tank cars just delivered.

Last word in tank-car construction, they have double-thick insulation; corrosion-resistant lining; double relief-valves; safety platforms, and outlet valve operated from outside the dome.

As part of our long term program in safeguarding the purity of *Westvaco Textile-Grade Caustic Soda* right to the customer's siding, all Westvaco tank cars are being modernized or replaced *just as fast as shop facilities are available.*

Westvaco Textile-Grade Caustic Soda

Uniformly High Quality from a Conveniently Nearby Source

Liquid • Flake • Solid

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Westvaco
CHEMICALS

"CROWN" TESTED SALUTES ST. GEORGE'S "SALYNA" ON ITS TENTH ANNIVERSARY

REG. U. S. PAT. OFF.

No. 33 of a series—from our files on the new "CROWN" Tested Plan

HERE INDEED is an achievement among rayons . . . a fashion fabric that's ten years old and still going strong! For St. George's customers say today . . . as they have ever since 1934 . . . that there's literally nothing like "Salyna."†

Manufacturers tell us that "Salyna" is just what the doctor ordered . . . that dresses and sportswear made from this fabric bring plenty of re-orders. Manufacturers who have combined different shades of "Salyna" . . . including black on white . . . say they have never received a complaint of fading or "bleeding" of the colors.

Department stores, restaurants and similar institutions report using "Salyna" for employees' uniforms. And almost without exception they state they have had no further trouble with uniforms fading, shrinking or stretching out of shape.

†80% SPUN RAYON, 20% COTTON
SALYNA . . . AS SEEN IN VOGUE

And at retail stores many women ask for "Salyna" by name . . . put in their orders far in advance. In fact, some stores say that a shipment of "Salyna" is frequently all distributed the same day it is received.

Of course there are good and sufficient reasons for "Salyna's" success story . . . and here they are.

In the first place, "Salyna" has exceptional fashion appeal because of its outstanding beauty. Then . . . as an advance report to retail customers on its serviceability . . . it wears the CROWN Tested Green Tag. This tag tells the consumer that the fabric is washable at 160° F., without special care. That it will not shrink or stretch more than 2% in laundering. That it resists sunfading, perspiration staining, and gas fading. In short, all the long wear and satisfactory service that comes with St. George's "Salyna" is predicted by that "green light" tag!

NEW INFORMATIVE LABELING

CONSUMER SATISFACTION UNDER THE THREE TAG SYSTEM

"Crown" Tested Rayon Fabric

A better way to buy rayon fabrics—This identification is awarded only to fabrics containing CROWN Rayon, after they have passed the CROWN Tests for serviceability. These tests predict the fabric will not change visibly in color or in texture, nor in size more than 2%, if instructions are followed. Samples of every dye lot of fabric have been tested against minimum requirements set and maintained by

AMERICAN VISCOSE CORPORATION

Producer of CROWN* *Rayon Yarns and Staple Fibers*

Sales Offices: 350 Fifth Avenue, N. Y. C. 1; Providence, R. I.; Charlotte, N. C.; Philadelphia, Pa.

*Reg. U.S. Pat. Off.

"Lovely colors build morale"

SAYS BROWNIE OF FOXBROWNIE INCORPORATED...

...who creates clothes for women of discerning taste, recommends color as a means of self-expression. "I am using more color in my collection for Fall than ever before," says this imaginative young designer. "The woman of today, leading a war-busy life, wants softer and more feminine clothes than she has had in some time. Color imparts gaiety to clothes and is a morale-builder."

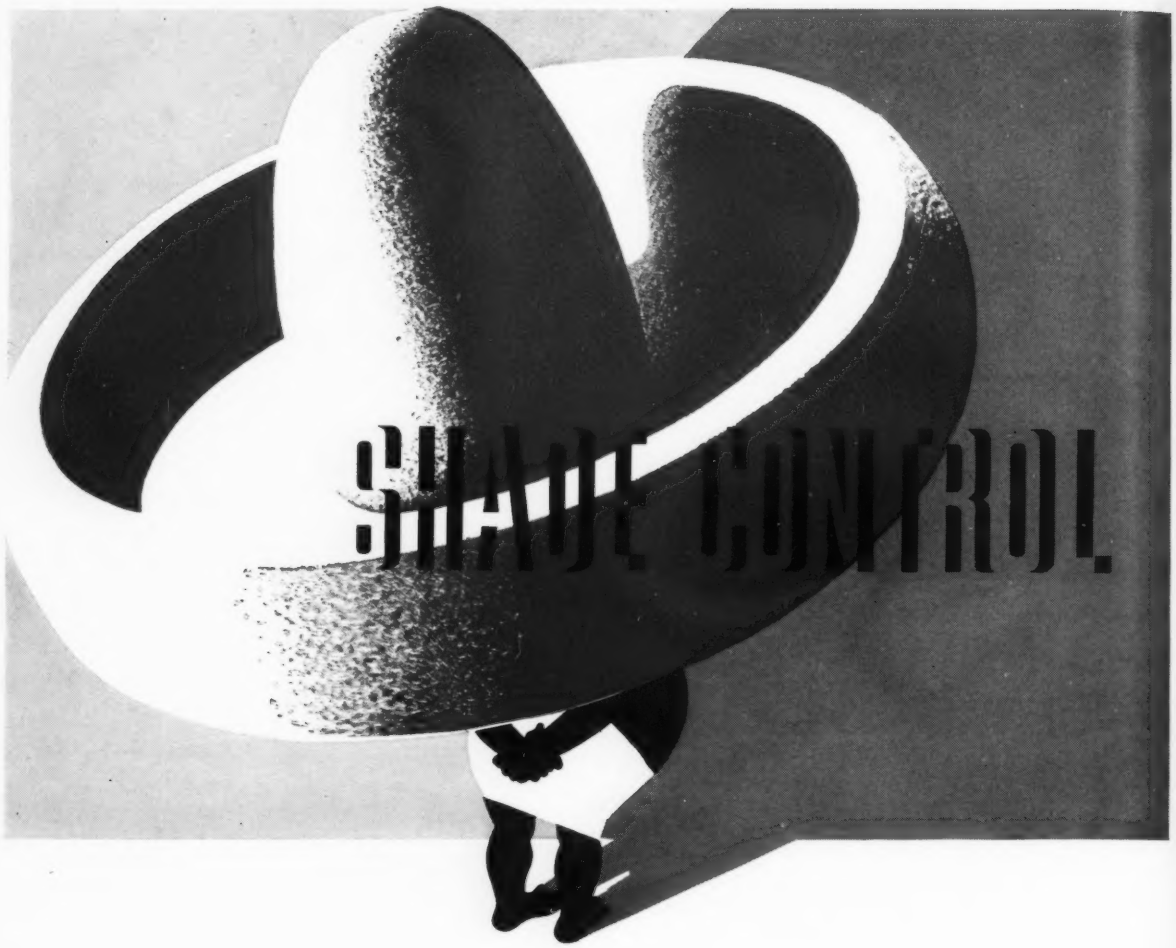
Inspired by the romantic and colorful in fashion history, this artist combines color and fabric in a manner sufficiently unconventional and dramatic to influence the modern trend. Creole fashions inspired the gay carnival colors of her spring and summer designs, while for Fall, the Renaissance influence is evident in clever adaptation of design and embellishment.

Brownie's utilization of richly colored fabrics and embroideries not only enhances the studied simplicity of her clothes, but imparts great elegance to them. Brilliant purples and greens, posed against black; royal blue with pink; rust brown with black, are but a few of her interesting color harmonies.

New interest in color creates new dyeing problems. Whatever your needs, you will find Calco ready with expert advice on the use of new colors and their application. Skilled technical assistance will be available upon request. CALCO CHEMICAL DIVISION, AMERICAN CYANAMID COMPANY, Bound Brook, N. J., New York, Chicago, Philadelphia, Boston, Charlotte, Providence.

. . . An outstanding success in the Brownie collection is this chartreuse jersey long-sleeved dinner dress, shirred at the V neckline, belted in gold. With this is worn a coral-lined green wool box coat embellished with paillette disks.

COLORS BY CALCO



CALCOMET DYES now bring into one complete technique results previously associated only with all three chrome methods for wool dyeing. Utilizing an improved metachrome process, these dyes bring more accurate shade control, and important economies in time, labor, power, and materials.

Heavy-bodied shades are possible for the first time with the metachrome method, and jet black, navy, dark brown, and deep maroon can be matched with the same ease as the light to medium shades.

Many problems originating with skittery or tippy dyeings have been solved by Calcomets.

Uniform distribution of dyes throughout the wool fibers will tend to give improved fastness to light.

Shade-matching problems are simplified because Calcomets develop to shade quickly and "adds" can be regulated to match standards.

Reproducibility feature is preserved from batch to batch.

The new Calcomet line is available in eleven rich colors. Calco Technical Service will assist with initial dyeings. Ask your Calco representative to arrange a demonstration.

CALCO CHEMICAL DIVISION, AMERICAN CYANAMID COMPANY, Bound Brook, N. J., Chicago, New York, Philadelphia, Boston, Charlotte, Providence.

PATENTS COVERING THE METHOD AND THE CALCOMET DYES HAVE BEEN APPLIED FOR

CALCOmets

PRINTED IN U. S. A.

New Lower Prices For Polyethylene Glycols and "Carbowax" Compounds

These glycols

- Are chemically stable
- Have a broad range of hygroscopicities
- Are soluble in water
- . . . and are available in consistencies ranging from liquids to waxy solids resembling petrolatum or paraffin.

● At their new lower prices, "Carbowax" Compounds—solid polyethylene glycols—and liquid Polyethylene Glycols should be even more popular as lubricants, binders, plasticizers, or thickening agents . . . applications where they are often superior to many natural oils, gums, and waxes ordinarily used.

Chemically, Polyethylene Glycols can be modified by reacting the hydroxyl groups to form surface-active compounds useful as detergents, and emulsifying agents, or unusual alkyd resins.

The "Carbowax" Compounds are solids supplied in five different molecular weights ranging from 1000 to several thousand. The liquid Polyethylene Glycols are available in four molecular weights from 200 to 600. Almost any desired consistency can be obtained by blending them.

Write for further information on the physical properties, uses, and new lower prices of the Polyethylene Glycols and "Carbowax" Compounds.

Some Commercial Applications of Polyethylene Glycols and "CARBOWAX" Compounds

Ceramics
Color binder and vehicle, mold lubricant, modifier for cements and plaster.

Agriculture
Binders, carriers, and spreaders for plant hormones, fertilizers, larvicides, and insecticides.

Leather
Polishes; cleaners; dye penetrant; dressing agent.

Metal
Extrusion and drawing lubricants.

Paper
Coating, softening, and sizing agents; plasticizer for zein coatings.

Pharmaceuticals
Carrier and solvent for hormone, sulfa drug, peroxide, and other ointments.

Photography
Film lubricant.

Polishes
Lubricant and film-former; spreading agent.

Pigments and Paints
Carrier and dispersing agent.

Rubber
Mold lubricants; compounding wax; activator for mercapto-type accelerators.

Textiles
Lubricant: dispersant for dyes; finishing agent; sizing compounds; detergent intermediate.

Cosmetics
Ingredient of creams, lotions, hair-dressings, and make-up preparations.

BUY UNITED STATES WAR BONDS AND STAMPS

CARBIDE AND CARBON CHEMICALS CORPORATION
Unit of Union Carbide and Carbon Corporation
UCC
30 East 42nd Street, New York 17, N. Y.

PRODUCERS OF SYNTHETIC ORGANIC CHEMICALS

"Carbowax" is a registered trade-mark of Carbide and Carbon Chemicals Corporation.
The term "Polyethylene Glycols" refers to those Polyethylene Glycols higher than triethylene glycol.

Astonishing results are being accomplished with the use of this

NEW!

WATER SOFTENER

PERMALENE W. S.*

1. Permalene W.S. can be used to soften all water used in wet processing and remains stable at low or high temperatures.
2. Permalene W.S. is employed as a stabilizer with sodium or other peroxides in bleaching rayon, acetate, nylon, cotton, Aralac and wool.
3. Permalene W.S. is excellent for redispersing boil-off, scouring and dye baths which have precipitated after running for a length of time.
4. Permalene W.S. can be used in the dyeing of Aralac. Since strong alkalies are not practical and the pH of the bath is very important, Permalene W.S. makes an excellent assistant as the pH of its bath does not tend to build up.
5. In the washing of prints Permalene W.S. has unusual properties of dissolving and retaining in solution the many compounds used in printing the fabrics and which often precipitate in the soaping-off operations.

Reg. U. S. Pat. Off.

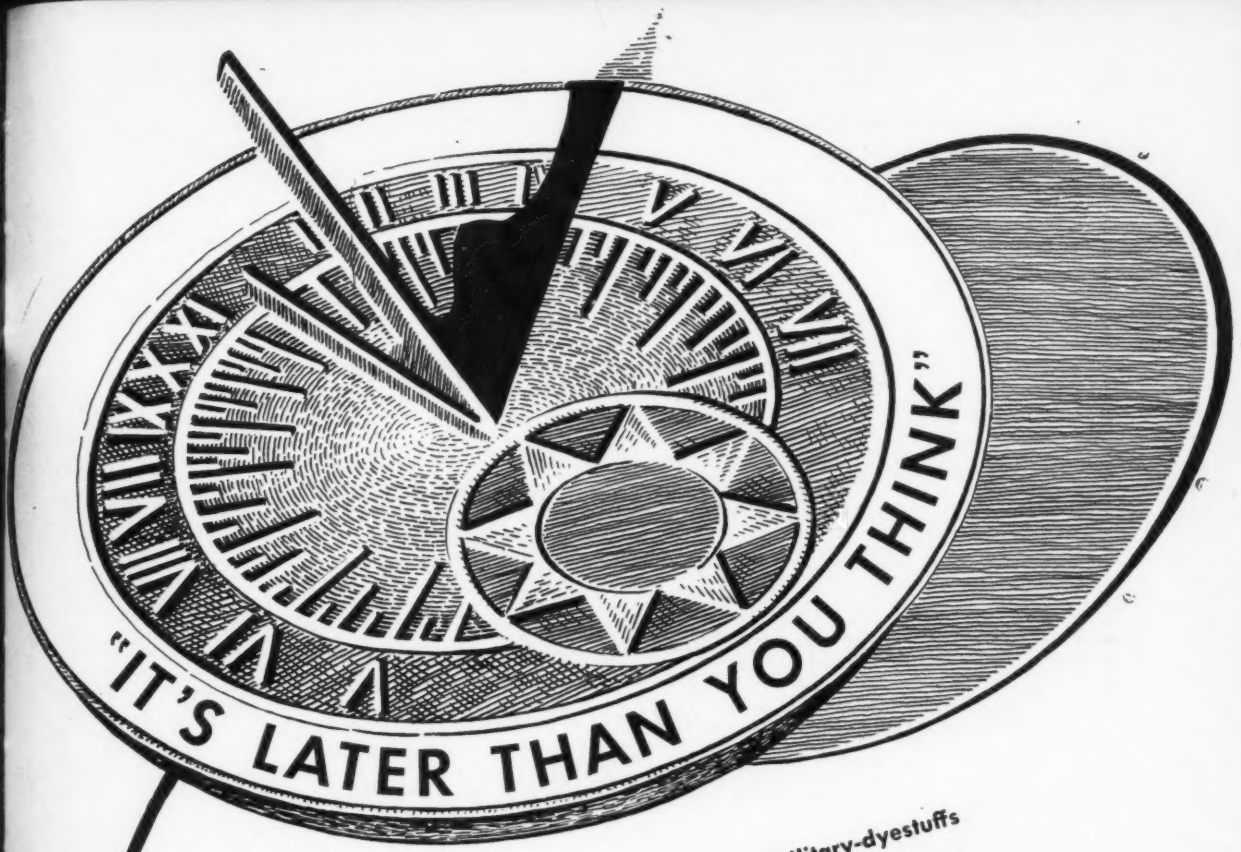
REFINED PRODUCTS COMPANY

Lyndhurst • New Jersey

New England Representative: E. L. LEGG, P. O. Box 597, Providence, R. I.

Canadian Selling Agents: BERKELEY PRODUCTS CANADA, LTD., 41 Hillcrest Avenue, St. Catharines, Ontario, Canada

PERMA-CIDE • PERMA-TERGE • PERMA FIX • PERMA WET • PERMA PAR R • PERMA PAR K • PERMA PAR SOL • VAPOLINE



Filling America's tremendous reservoir of military-dyestuffs and chemicals took time. To drain and refill it to overflowing for reconversion's demands will take a still longer time.

Right now, NATIONAL TECHNICAL SERVICE is staffed to meet your present needs for technical help *and* to render valuable aid on dyeing the new post-war textiles you may be working upon. Every hour of dye-formula development done *now* will hasten the delivery of your first post-war orders . . . will speed up your own complete reconversion to civilian fabrics.

NATIONAL ANILINE DIVISION

ALLIED CHEMICAL & DYE CORPORATION

40 RECTOR STREET NEW YORK 6, N. Y.

BOSTON
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PORTLAND, ORE.
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E. I. DU PONT DE NEMOURS & COMPANY (INC.)

. . . Cordially invites the members of the AATCC to visit and make use of the facilities of the Du Pont Exhibit, 1123 Boardwalk, Atlantic City, during the meeting of October 12, 13, and 14. An exhibit of special interest to Textile Chemists and Colorists will be on display.

Du Pont Dyestuffs

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

DU PONT DYESTUFFS

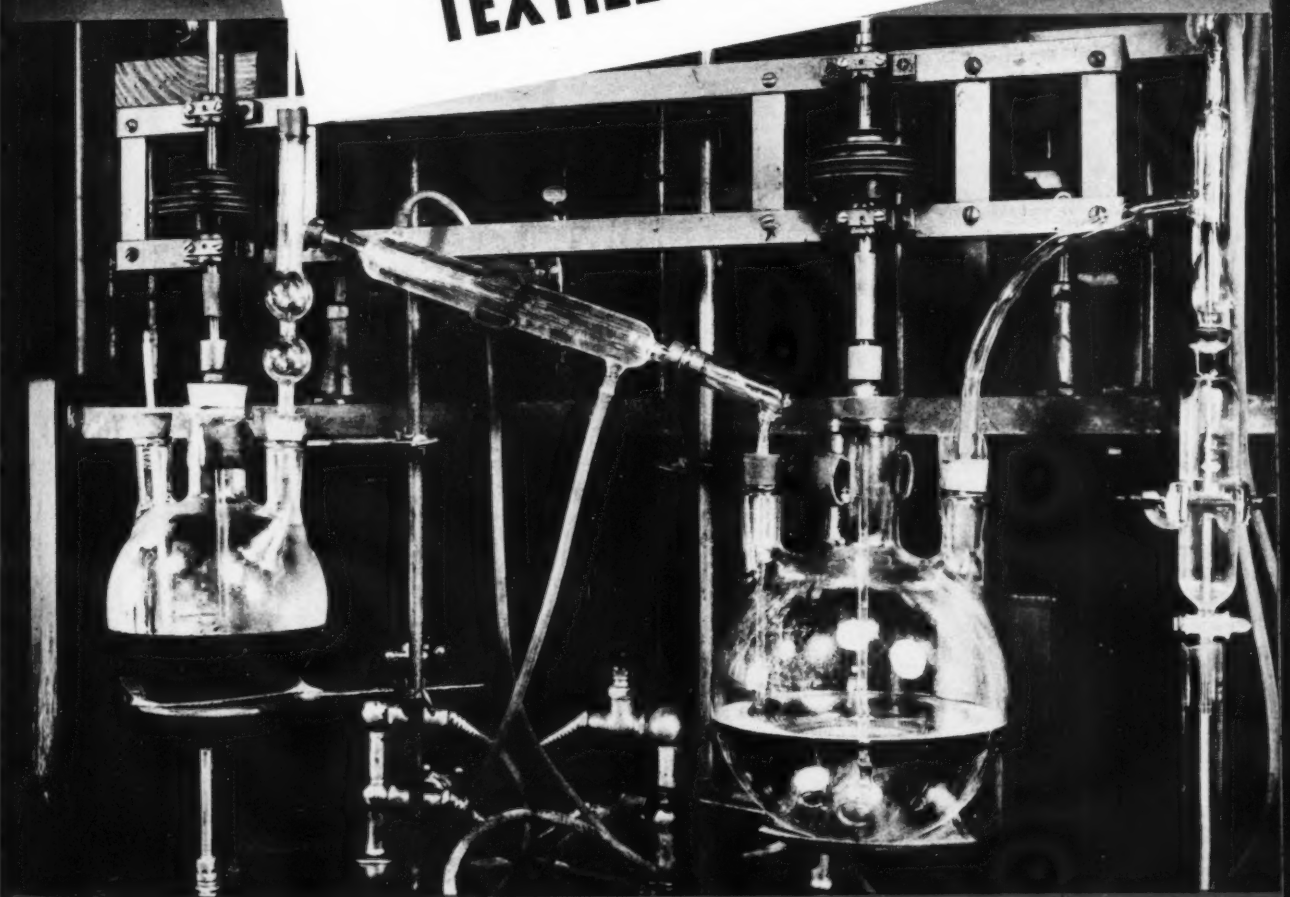
HOUGHTON ANNOUNCES

a far-reaching

RESEARCH PROGRAM

for post-war

TEXTILE PROCESSING



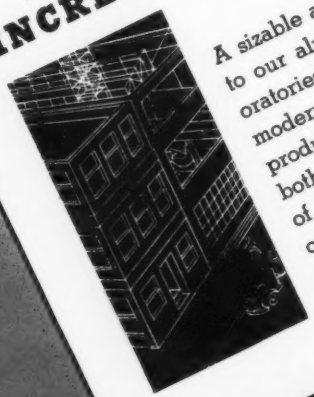
... Already begun –

The world of tomorrow will be an era of chemistry. Already time-honored staple oils formerly used to prepare textile fibers for weaving and knitting have been replaced by synthetic products which actually do a better job. And this is only the beginning! The name of E. F. Houghton & Co. is by no means new in textile processing. Even before war scarcities made traditional favorites hard to get, this company earned a reputation for its ability to produce synthetic materials to replace staples. Although still at full speed on war production, we are making ambitious plans for the post-war era. Here are a few of the new things to come:

PLANS...the better to

#1

INCREASED LABORATORY FACILITIES



A sizable addition is now being built to our already spacious Textile Laboratories. This will house the most modern of laboratory equipment for product development and will enable both original research and pre-testing of new textile products. Manufacture on a practical production scale is assured by making plant batches of the new products are field-tested

#2

AUGM

NEW-ERA OILS AND CHEMICALS FOR

to serve you...

#2

AUGMENTED STAFF

Research projects require men—trained organic chemists who are capable of developing products for textile processing. Houghton has measurably increased its textile research staff in recent months, and has added practical field men of mill experience. By this added manpower new ideas may be translated into practical, proven benefits to be demonstrated to mills throughout the entire United States.

#3

CONFIDENTIAL SERVICE

We take pride not only in our personalized mill service on such processes as sizing, scouring, etc., but also in our ability to keep faith with those who seek that service. Each mill problem is treated confidentially. A report made to a concern at its request is its own property, not broadcast to others. You can safely place your processing problems in our hands, confident that we will report to you . . . and to you alone.

#4

ALREADY UNDER WAY

Not all development work is in the distant future. Each day, each month, brings forth new ideas. Research is a never-ending task, including many projects started years ago, which are only now beginning to bear fruit. Familiar to many are these product groupings on which we are establishing a reputation:

NEW FINISHES • NEW SOFTENERS • NEW SURFACE ACTIVE AGENTS • NEW REPELLENTS • NEW SIZES

What's your problem? Write . . .

E. F. HOUGHTON & CO.

303 W. LEHIGH AVENUE
PHILADELPHIA

1305 W. MOREHEAD ST.
CHARLOTTE

Offices in all principal cities

FOR TEXTILES...

SOME RESULTS OF *Yesterday's research...*

AVAILABLE TODAY

WETTING AGENTS

The Surfax line of surface-active agents for rapid wetting out, penetration and softening. Oil-type products possessing fast wetting speed at low concentrations. Valuable also for sanforizing where wetting back is a necessary requisite.

DETERGENTS

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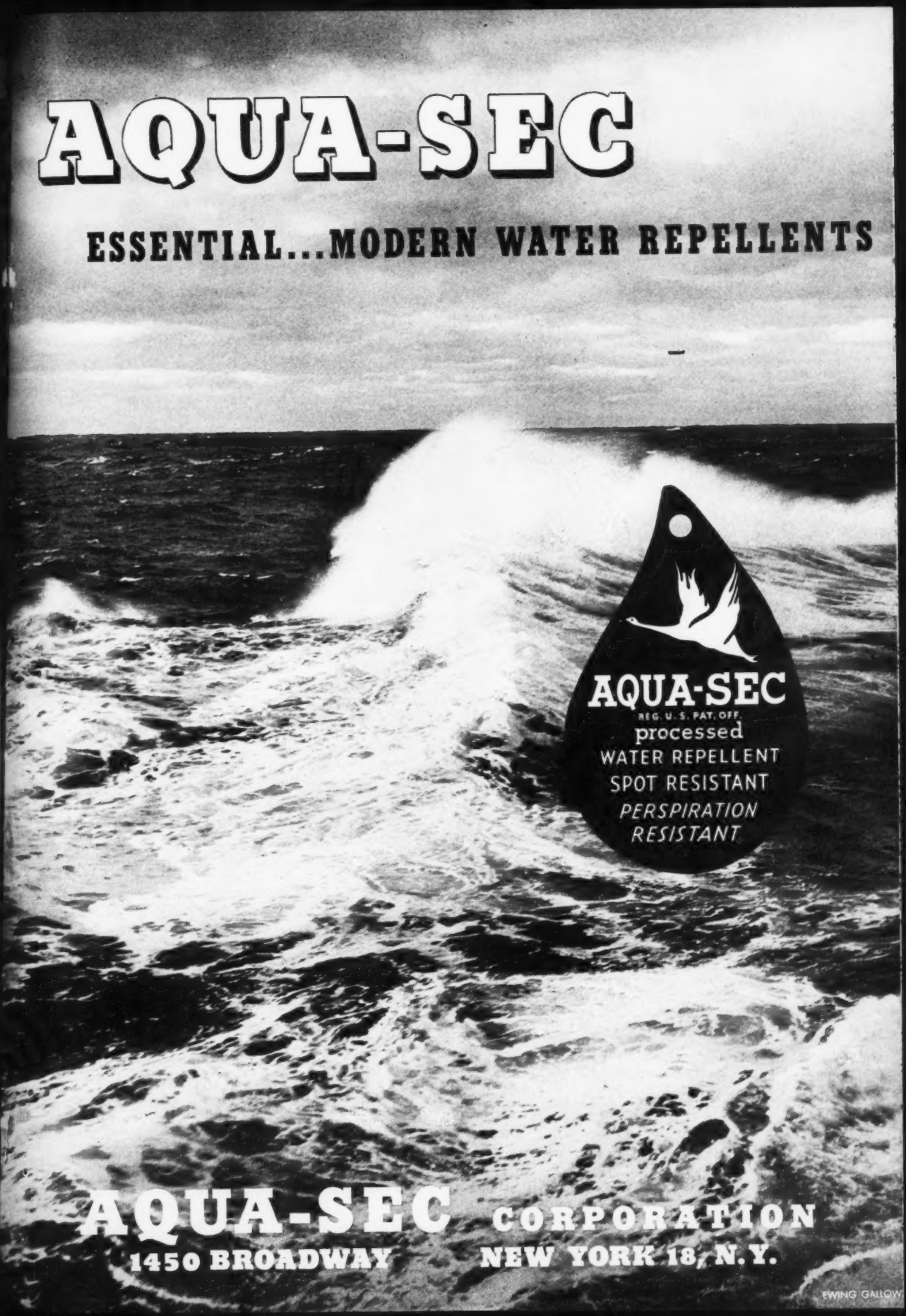
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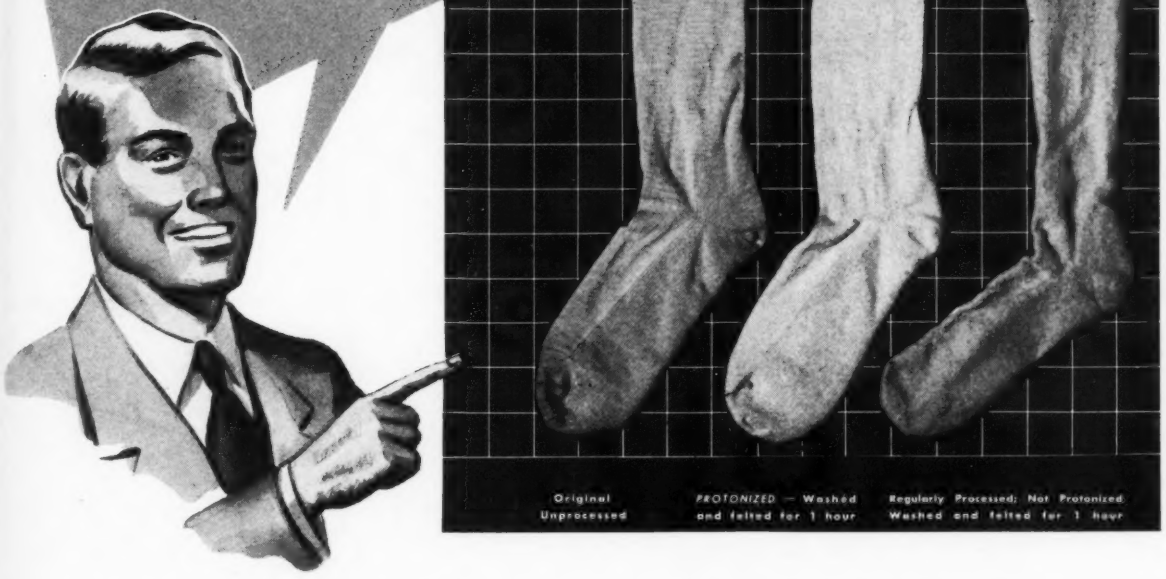
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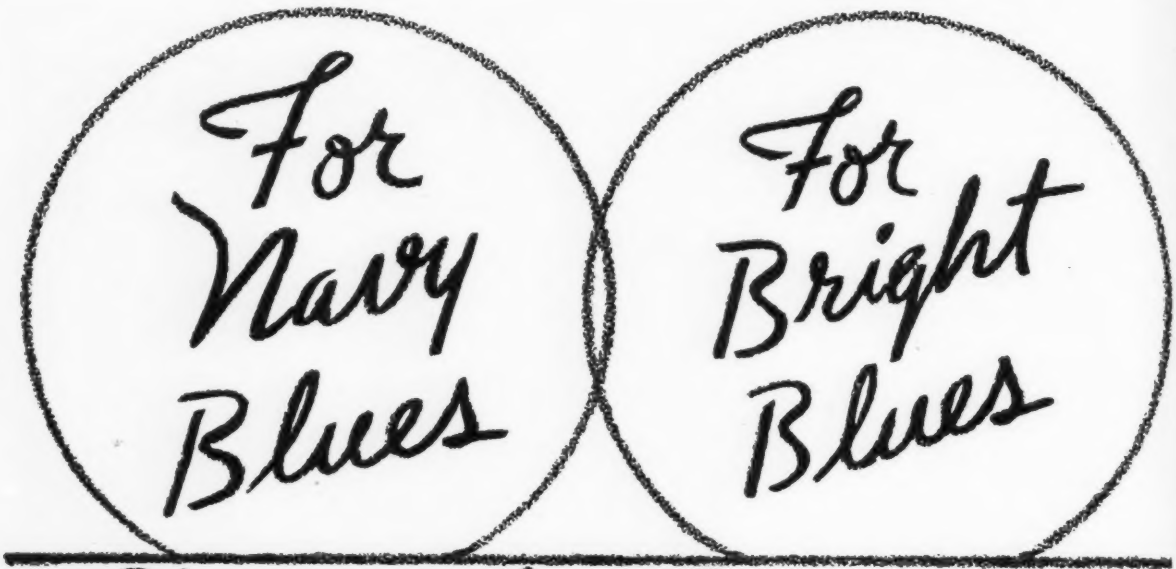

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AMERICAN
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VOLUME 33 SEPTEMBER 25, 1944 NUMBER 20

CONTINUOUS PEROXIDE BLEACHING

BY THE TECHNICAL STAFF
of the
Buffalo Electro-Chemical Co., Inc.

IV–Its Adaptability

This is the fourth and last in a series of four articles on the subject of continuous peroxide bleaching. The titles of the four parts are as follows:

I. Development
II. Operation
III. Equipment
IV. Adaptability

WITHIN the past 15 years, the manufacturers of hydrogen peroxide have developed and put into operation new techniques in the bleaching of cotton piece goods. They have constantly worked in laboratories and provided service in the field to reduce processing costs in the bleachery wherever possible. Their efforts have not been confined merely to the actual application of peroxide—the bleaching step—but rather to the entire wet processing. Hence, quite logically, their newest development commonly referred to as "the continuous bleach" has been designed to include all necessary steps in wet processing the goods—preparing and bleaching them quickly and efficiently—and it has been made adaptable to rope or open width handling. It is now available to all bleachers of cotton piece goods. The major technical difficulties have been overcome and it is now up to the individual bleachery to decide whether it will be suitable for its individual needs.

Basically, continuous peroxide bleaching in its latest form is made possible by the use of direct steam for heating the goods. In the kier, steam is used directly or indirectly to heat solution which in turn heats the cloth. In this new process, the large amounts of water used in the kier have been eliminated and it is the use of direct steam on the cloth, carrying more concentrated chemical solutions, that makes it possible to put the "continuous" in the continuous bleach. In reality, it is a further development of steam bleaching which is neither a new nor complicated idea. It is the method of applying steam to cloth and the equipment involved which is new.

Steam bleaching involves a shifting of the several factors—time, temperature, peroxide concentration, pH and alkalinity—which, as every bleacher well knows, are the basis of peroxide bleaching in any piece of equipment, whether it is a kier, jig or steeping bin. The changing of one factor has its effect on the several others because they are all interlocked. When direct steam is used as the heating medium for the dampened cloth, there are savings of:

Steam—because less water is heated,

Time—because higher treating temperatures may be obtained and because higher peroxide concentrations may be employed,

Chemicals—because less water is used and concentration of alkali has been increased resulting in higher efficiency of the peroxide bleaching solution.

These are the savings which are the outstanding advantages of steam bleaching.

Until several years ago, these savings were not impressive; many difficulties were involved in applying steam to cloth on a commercial scale. The textile industry had nothing in the way of equipment which could be readily adapted to the job, and so it was necessary to design and prove entirely new apparatus. Many ideas and gadgets were tried but the *Stainless Steel Steam J-Box* has been the solution. It is this item which takes advantage of the reduction in time and the efficient utilization of chemicals mentioned above. Its use is solely responsible for the recent success of steam bleaching. By replacing the kier with the steam J-box, the preparation and bleaching of cotton piece goods can be put on a continuous basis, combining the most economical method of peroxide bleaching with the most efficient manner of handling cloth.

You are probably considering changes to your bleachery after the rush of war production, and you are undoubtedly considering continuous peroxide bleaching. The following discussion describes how continuous steam bleaching will affect production and processing costs, and it is hoped that it will help you in making your decision.

ROUTING

To begin with, in a continuous steam bleaching range, the cloth travels through the bleachery—from the gray room to the white bin—in approximately two and a half hours. First, it receives a pretreatment such as gray souring or desizing, then after washing, it is prepared by saturating with an alkaline solution and steaming in a J-box through which it passes in about one hour. After another washing, it is resaturated, this time with the peroxide bleaching solution, and steamed in a second J-box and then washed. This process retains all the benefits inherent in peroxide bleaching—high chemical quality, permanent white, and lower amount of seconds—and also results in greater uniformity, because the treatment is a continuous rather than a batch operation. It will fit in with your production plans very readily. With it, you can handle colored yarn goods, or whites, or goods for dyeing, with the same equipment. In changing over from one type of goods to another, only the formula is changed. Other treatments that you may have in mind, such as mercerizing or finishing, can be carried out in conjunction with the bleaching. In fact, the entire system can be synchronized to result in a completely continuous procedure from the gray room to the white room.

PRODUCTION

Any continuous system, whether it is in a steel mill, automobile factory, airplane plant or a textile mill, operates to its great-

est advantage when there is a sufficient volume of material to keep in operation 24 hours per day throughout the work week. Production is, of course, dependent on running speed, but when operating continuously, every piece of machinery in the entire system is constantly producing. Not one is idle. This means a much lower charge for overhead than when production is on a one or two shift basis.

The running speed which determines the volume of goods produced through a continuous range in a bleachery is dependent on several factors, such as the manner of handling the goods (in the rope or the open width) or the most suitable washing speeds or the capacity of the finishing department. For efficient production, a weekly volume of 400,000 yards may be considered the minimum.

The following table illustrates the production possible by *continuous* operation of one range throughout a five-day week at various running speeds:

Average Running Speed	Production in 120 hours
50 yds. per min.....	360,000 yds.
100 yds. per min.....	720,000 yds.
150 yds. per min.....	1,080,000 yds.
200 yds. per min.....	1,440,000 yds.
250 yds. per min.....	1,800,000 yds.

It is readily apparent that one range operating at normal speeds has remarkable productive capacity and that it can treat the same amount of cloth that an average bleachery running cloth at about 250 yards per minute will produce with eight or ten kiers. Furthermore, the goods are fully bleached in two and one-half hours instead of twenty. This is a very important feature especially for commission bleacheries which want to handle rush orders. It also means that up to 80 per cent less cloth is tied up in process in the bleachery so that the required stock is lower. This results in a substantial reduction in the inventory investment.

Those bleacheries whose production falls below the yardage indicated for a normal operating speed of their cloth, would not be able to keep a range in operation continuously. However, it is entirely possible to steam bleach on a one or two shift basis with substantial savings. These may not be quite as great as when operation of a large bleachery is made completely continuous but they still will prove very sizeable in most instances.

EQUIPMENT

The equipment which makes up a steam bleaching range can be arranged compactly and conveniently. Usually it is placed in a straight line, avoiding all waste of motion and of space, but it may be fitted into other locations. This latter factor is of importance when you are thinking of converting your present bleachery to steam bleaching: you do not want to shut down your bleachery completely. You will find that the equipment can be arranged so that the change-over is made with very little loss of time. The minimum floor area required amounts to 1800 sq. ft. per range, or approximately that space taken up by a chemic range—exclusive of the kiers.

The area required by the two J-boxes in a complete range is approximately equal to the area taken up by two kiers.

The J-boxes will produce up to 5000 lbs. per hour, whereas two kiers would produce only about 600-1000 lbs. per hour, depending on the kier load, length of treatment, etc. This means at least five times more production per unit of floor space. The exact size and type of the required J-boxes are dependent on the cloth being processed and the running speeds. These J-boxes are of sturdy, simplified construction permitting the largest production with a minimum of space.

The equipment other than the J-box in a continuous steam bleaching range, the washers and saturators, are substantially standard pieces, the same as those found in any bleachery. *In fact, any bleachery with two or three washers in good working order, to withstand continuous operation, and with two saturators or padders, can put its production on a completely continuous basis by replacing the kiers with two of these new type Steam J-boxes.* If you plan to replace some of your old equipment, such as washers, you will find that new modern designing has combined space saving features along with increased efficiency for heating and reusing water. It goes without saying that new equipment performs better than old, but if your present equipment will serve, much of it can be used in a continuous bleaching range.

The expense involved in converting to continuous bleaching is, of course, dependent on the amount of new equipment which has to be purchased. For rough calculating, a J-box with piler, complete and installed, costs approximately $8,000. A complete range (all new equipment) ready to produce, costs approximately $60,000. Therefore, it is evident that this system must show some savings over present processing costs in order to pay for itself in a reasonably short time. The above mentioned savings in space and time may reduce overhead considerably; you will be able to use the extra floor space in the bleachery for other purposes. But, in addition to these, if you steam bleach with peroxide you will find savings in processing costs regardless of your present method of handling cloth.

The general trends in requirements and performance of continuous steam bleaching ranges have become established. The following information may be helpful to you in making comparisons with your present system.

CHEMICAL COST

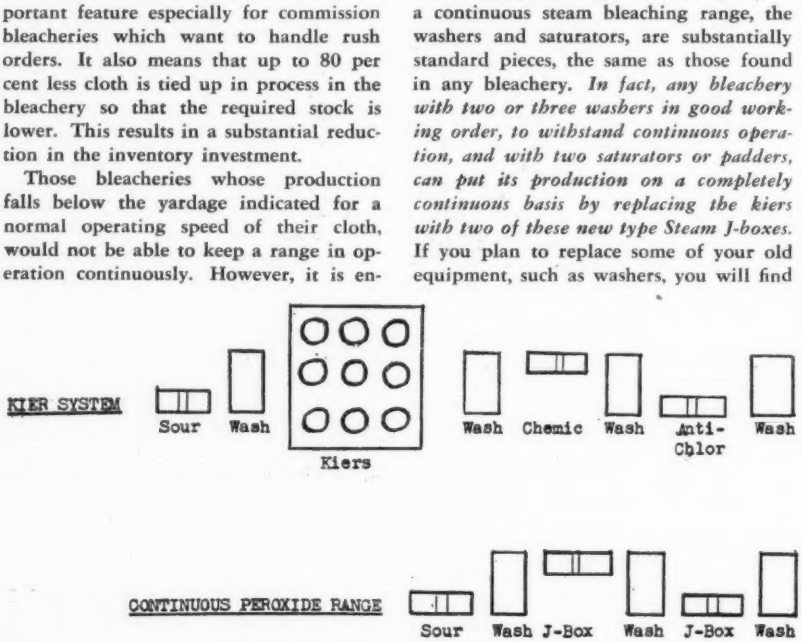
Continuous steam bleaching, as mentioned before, is peroxide bleaching at its lowest cost. The peroxide acts with its greatest efficiency. At the present time, the minimum chemical costs for full whites is approximately $1.25 per 1000 lbs. of cloth; for goods containing colored yarns, approximately $1.50 per 1000 lbs. of cloth. Much, of course, depends on the grade of cotton, washing facilities, treatment necessary, etc., but for the average bleachery, the cost will be between $1.50 and $2.50 per 1000 lbs. of cloth.

STEAM

One J-box requires less than 300 lbs. low pressure steam per 1000 lbs. cloth. The most perfect heating system which eliminates *all* heat losses would use about 200 lbs. steam. This is the theoretical amount necessary to heat cloth carrying its own weight in solution (100 per cent saturated) from room temperature to 212° F. For each kier treatment about 1200 lbs. steam per 1000 lbs. cloth are required.

WATER

Less water is used for treating cloth in a J-box than in a kier. This difference becomes very small, however, when all the water for washing is included in the total amount. The greatest savings in water are to be found where washers throughout the entire range are equipped with coun-



Comparative Floor Area Requirements.

tercurrent systems so that much of it can be reused.

POWER

Straight line production, handling the cloth through each piece of equipment once, requires a minimum of driving power in reels, washers and squeezers. In other words, the cloth is never put into bins for temporary storage so that the amount of handling is kept at the absolute minimum.

LABOR AND CONTROL

Assuming a continuous bleaching range is divided into two units, each consisting of a saturator, J-box, and washer, a range requires one man per unit or a total of two men. However, provision must be made for starting the cloth in the gray room and subsequent operations for finishing and drying. Where two ranges are installed side by side, one man is able to operate one unit in each range. The cloth is a continuous strand so that, once started through, there is no need for the bleachery foreman to worry whether this kier or that washer or that bin will be available at the proper time.

The feeding of chemicals to the two saturators can be very much simplified. Concentrated chemicals as received from the supplier can be fed separately by mechanical means. There would be no need for mixing charges or making up chemicals in the bleachery, thus saving labor and eliminating the hazards involved in the operation. Losses due to storage of feeding solution are eliminated.

All controls for steam, chemicals, temperature and cloth are conveniently located on a central control panel for the operator to keep the range running at its greatest efficiency.

MAINTENANCE

The operation of all the equipment of a steam bleaching range is continuous but there are fewer pieces. Furthermore, the most modern designed equipment is corrosion resistant, of simple construction, convenient to service and has a minimum of moving parts.

CONCLUSION

All in all, there are many points where savings can be made by converting to continuous peroxide steam bleaching. A few mills may find that in some respects they are now operating just as efficiently as they would under this new system; some of the points mentioned would not be of interest in their particular case. But assembly line technique offered by steam bleaching is far reaching and fundamentally new. It is up to the individual bleacheries to decide what phases apply to them and whether the savings would add up to a sufficient sum to warrant its adoption.

Steam bleaching is a most economical way to use hydrogen peroxide. By itself, it can effect many savings in processing costs, but when coupled with the fact that operation can be completely continuous, it brings the total cost of wet processing cloth through the bleachery to its very lowest level.

THE ESTIMATION OF DYESTUFFS

in Solution and on the Fiber*

E. WATERS

THE growing desire to know more about the processes of dyeing, and the demand for exact knowledge of such properties of dyes as rate of dyeing and exhaustion values, have stimulated increased interest in quantitative work. It is no longer sufficient to use qualitative terms when new dyes are marketed: the dye user wants to know in what manner, and by how much, new dyes differ from his standard dyes in order that he may compare the new with the old on an economic basis. Similarly, the dyer may wish to investigate his own works processes by quantitative estimation and determine the most economical conditions. Thus, in a method employing the standing-bath technique, the assessment of the dyebath is quite important, while, in the case of dyes applied by a padding technique, any affinity of the dye for the fabric will cause the padding liquor to weaken and necessitate re-charging with more dye; in both cases a rapid means of estimating dyebath concentration is most valuable.

There are three main fields in which quantitative estimation is used. The first field is that of academic research in Universities and Technical Colleges. The second field is that of technical research, carried out mainly in the laboratories of large industrial concerns, Research Associations and, to some extent, Technological Departments of Universities and in Technical Colleges. The third field is in the control of manufacturing processes, and here, by the nature of his work, the practical man must follow the lead set by more academic colleagues.

QUANTITATIVE ESTIMATION OF DYESTUFFS IN SOLUTION

There are two distinct trends in this field. The truly academic worker leans towards chemical methods of estimation and the technical worker relies mainly on colorimetric methods. The reasons for this divergence are easily explained. The academic worker is generally working with small groups of similar products and is interested in the molecular properties of these compounds; provided that the formula is accurately known, a sound chemical method of estimation will give him the result in terms of mol. wt. The technician, on the other hand, is interested merely in relative quantities and the molar relationship is unimportant; colorimetric methods, therefore, are admirably suited to his purpose.

Chemical Methods of Estimation — By their very nature, few chemical methods of analysis are suitable for the general determination of dyestuffs, because the latter inevitably cover such a diverse field of organic chemistry. Of the few which do have a fairly wide application the best known is probably the titanous sulfate reduction method.[1] This method is applicable to any dye which is reducible with nascent hydrogen, and simple azo dyes are typical compounds which are readily estimated in this way, the azo linkage being destroyed. This method is sometimes unreliable, however, owing to the reaction being indeterminate or the precise formula of the dye being unknown. A more recent method of estimation with a fairly wide scope is that of precipitation with alkaloids, cinchonine sulfate being the reagent recommended.[1] Direct dyes and many acid dyes can be estimated in this manner, the

* Presented at a meeting of the Manchester Section of the Society of Dyers and Colourists on September 17, 1943. Reprinted from their Journal, August, 1944.

precipitate being determined gravimetrically and the quantity of dye thus measured. In some cases, however, the precipitation is incomplete, and this source of error must always be borne in mind and avoided where possible.

Another gravimetric method, applicable to basic dyes, is that of precipitation with silico-tungstic acid, the reaction with which appears to be quantitative.[1]

The only other method with wide scope which has received serious attention is that of titration with another dye. For instance, it is well-known that anionic dyes will precipitate cationic dyes, so direct dyes and acid dyes may be used to precipitate basic dyes. The dye is titrated until the liquor, when spotted on filter paper, shows a faint coloration due to excess of the added dye. Unfortunately, the end-point of the majority of these reactions is rather indeterminate and there is a tendency for the precipitate to dissolve in excess reagent, thus rendering the method somewhat inaccurate. It is possible that conductometric titration would give a better end-point, provided that the quantity of electrolyte present were small. Acid dyes may be titrated in a similar manner with Fixanol solution, which gives a better end-point, due in part to the fact that the reagent itself is colorless. This reagent has been used for estimating standing baths used for dyeing anodized aluminum.

The other methods available are rather specific in nature and so have very limited scope, e.g. the determination of Erythrosine by iodine content, or of Indigo Carmine by titration with permanganate solution.

Thus, none of the chemical methods is applicable to dyes in general and none of them is very simple or rapid. The main advantage of chemical methods lies in the fact that, providing the formula is accurately known, the quantity of actual pure dye is determinable.

As already noted, the technical research worker is usually concerned only with relative values where the molecular content is unimportant. For instance, in exhaustion values and estimation of take-up for standing baths the technician is not concerned with the molar concentration, but with the percentages of the original concentration. Similarly, in saturation values, rate of dyeing, washing tests, etc., the values measured are always relative, since the dye user is concerned with the weight of commercial dye and not with the mol. wt. The ideal relative method for measuring dye concentration is the optical method, in which the color of the dye solution is used to estimate the quantity of dye present. Obviously, such a method is of general application to all types of dyes.

Optical Methods of Estimation—(a) Absorptiometers—The fundamental property of dyes which renders colorimetric estimation possible is their absorption of light. Since in nearly all cases this absorption is selective, a sensation of color is produced and the greater the absorption the greater the intensity of the color. This absorption of light is connected with the concentration of dye by Beer's Law, which states—

$$I_T = I_0 e^{-k_1 c}$$

where I_T is the intensity of transmitted light, I_0 the intensity of initial light, c the concentration and k_1 is a constant. Coupling this with Lambert's Law connecting the absorption with thickness of solution, which states—

$$I_T = I_0 e^{-k_2 t}$$

where t is the thickness of solution, the Beer-Lambert equation is obtained—

$$I_T = I_0 e^{-kct} \text{ or } \text{Log } I_0/I_T = kct$$

The value log I_0/I_T is the logarithm of the reciprocal of the transmission of the solution and is referred to as the optical density, d. It is therefore posible to write the equation simply as—

$$d = kct$$

From this it is seen that, for a given absorption of light, c × t is constant. This is the basis of the simple Duboscq method of colorimetry.

In the Duboscq colorimeter light is passed through two cells fitted with adjustable plungers so that the optical length of the cells may be varied continuously (Fig. 1). The solution to be examined is placed in one cell and a standard solution of known concentration is placed in the other; the relative thicknesses of the solutions are then varied by means of the plungers until the two fields of view are matched in color intensity. Then, from the thicknesses of the solutions, the relative concentration of the sample with reference to the standard can be calculated.

Although Beer's Law is only rigidly true for monochromatic light, the altered form of the equation for heterogeneous light does not affect the relationship between thickness and concentration. The proof of this may be shown as follows—

Let the heterogeneous light be composed of monochromatic radiations $\lambda_1 + \lambda_2 + \lambda_3 \ldots$ etc., then —

$$I_0 = I\lambda_1 + I\lambda_2 + I\lambda_3 \ldots \text{ etc.}$$

After passage through a solution of concentration c and thickness t

$I\lambda_1$ is reduced to $I\lambda_1 e^{-kct}$ and—

Total transmitted light $I_T = I\lambda_1 e^{-kct} + I\lambda_2 e^{-k_1 ct} \ldots$ etc. Similarly for another solution of the same dye, and therefore having the same values of k, k_1, k_2, etc., the light transmitted by a thickness t_1 and concentration c_1 will be—

$$I\lambda_1 e^{-kc_1 t_1} + I\lambda_2 e^{k_1 c_1 t_1} + \ldots \text{ etc.}$$

On making a visual match, these transmissions are made the same and, therefore,

$$I\lambda_1 e^{-kct} + I\lambda_2 e^{-k_1 ct} + \ldots = I\lambda_1 e^{-kc_1 t_1} + I\lambda_2 e^{-k_1 c_1 t_1} \ldots \text{ etc. thus —}$$

$$I\lambda_1(e^{-kct} - e^{-kc_1 t_1}) + I\lambda_2(e^{-k_1 ct} - e^{-k_1 c_1 t_1}) + \ldots \text{ etc.} = 0.$$

Now in each bracket ct and $c_1 t_1$ are the same. Thus, if one of the brackets is positive all are positive, and if one of the brackets is negative all are negative. But since all $I\lambda$'s have positive values, the sum can only equal zero if the contents of each bracket equal zero, i.e.—

$$e^{-kct} = e^{-kc_1 t_1} \text{ etc., or } ct = c_1 t_1$$

Hence the proportionality between c and t still holds.

This method is a purely relative one, the standard solution of known concentration being an essential feature of the instrument. The accuracy attainable with these instruments is lower than that of many other colorimetric instruments, but is probably of the order of 5 per cent or a little less, depending upon the particular color being measured and the sharpness of its absorption band. The accuracy will be lower in the case of yellow dyes and lowest for yellow dyes having very sharp absorption bands. The reason for this is that differences in the amount of light absorbed are generally detected by the fall or rise in brightness, and there is naturally a threshold value which can only just be detected. In the case of yellow

(Continued on Page 413)

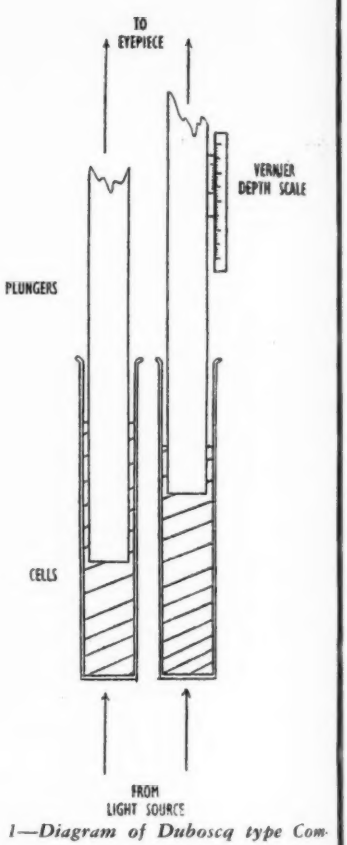


Fig. 1—Diagram of Duboscq type Comparator

PROCEEDINGS OF THE

American Association of Textile Chemists and Colorists

SEPTEMBER 25, 1944

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STUDENT CHAPTERS

Lowell Textile Institute
North Carolina State College
Philadelphia Textile Institute
New Bedford Textile School

Members should notify the **Secretary** immediately of all address changes.

CALENDAR OF COMING EVENTS

Meeting, Rhode Island Section, September 29, 1944, Providence Engineering Society, 195 Angell St., Providence, R. I. Speakers: Duncan Carmichael and Clifford A. Nangle, Aralac, Inc., "Aralac: Its Properties and Processing."

Meeting, Philadelphia Section, September 29th, 1944, Hotel Philadelphia, Philadelphia, Pa. Reports of committee chairmen for annual meeting will be given.

Annual Meeting, Hotel Claridge, Atlantic City, N. J., October 12, 13 and 14, 1944. Auspices of Philadelphia Section.

Annual Meeting, Piedmont Section, Hotel Charlotte, Charlotte, N. C., November 3, 1944.

Meeting, Northern New England Section, October 20, 1944, Hotel Manger, Boston, Mass. Speaker: Lt. Col. John H. Talbott, Climatic Research Laboratory, Q.M.C. "Cotton and Woolen Clothing and Equipment for the Army."

Meeting, New York Section, November 17, Symposium on "Recent Developments in Synthetic Fibers and their Uses in Fabrics."

Abstracts of Papers to be Presented at ANNUAL MEETING

Atlantic City, N. J., Saturday, October 14, 1944

TESTING GROUP

1. *Service Testing of Textile Material*

Dr. Jules Labarthe, Jr.
Fellow, Mellon Institute of Industrial Research

The technologist engaged in the evaluation of consumers' textile goods uses the standard methods by which fabrics are tested commercially and improvises techniques to simulate conditions of use of the garment. These problems have made store laboratory technicians more representative of the consumer viewpoint than of the retailer. It is difficult to define and measure conditions of use and resulting wear, fading, deterioration, and other evidences of garment failure. The Quartermaster Corps in developing and appraising garments worn by the Army during this war has utilized field testing, controlled wear conditions, physiological laboratory observations in combination with textile laboratory observations in combination with textile laboratory tests. These new techniques may be of use to many retail establishments and, through study, may serve more closely to correlate laboratory test methods with actual use by the public.

2. *Laboratory Tests As Indices of Quality in Textiles*

A. Griffin Ashcroft
Driector of Research, Alex. Smith & Sons Carpet Company

This paper is an analysis of an apparent trend in the perversion of laboratory testing of textiles toward political, advertising, sales and similar commercial and subjective ends with a consequent weakening of desirable application of laboratory testing to research, product development and manufacturing control.

It classifies textile testing in relation to several types of quality criteria and illustrates some perversion of laboratory tests current in textile circles.

Suggestions are given on presentation and interpretation of laboratory test methods designed to encourage legitimate scientific use, and to limit exploitation for either public welfare or commercial gain.

3. *The Preparation of Specifications for Textile Materials*

Lt. Col. Frank M. Steadman
U. S. Army, Q.M.C., Philadelphia Depot

The preparation of specifications must be exact and unambiguous since they form the basis of legal contracts. Specifications must include the requirements as to design, quality, and the methods of measurements of each. Characteristics may be based on functional performance requirements, or upon standards of good workmanship, where functional minima cannot be determined readily. Specification requirements must be constantly reviewed on the statistical analytical basis to insure their complete logic.

4. *Consumer Protection in Informative Labeling*

Earle M. Edgerton
Director of the Technical Control Department, Pacific Mills, New York

War time shortages and restrictions have resulted in substitutions both in basic grey cloths and in dyeing and finishing operations. Many of these substitutions have effected the durability and color-fastness of textiles. Research programs have brought out many new developments in dyeing and finishing for present and post-war operation. Informative labeling has a most important part to play in educating and protecting the consumer in the application of these new developments, as well as in the proper evaluation of present-day substitutions.

COTTON GROUP

1. *Recent Developments on the Application of Vat Dyestuffs*

Lt. R. S. Stribling
U. S. Army, Q.M.C., Philadelphia Depot

Demand for a wider variety of fabrics possessing maximum fastness for military uses has resulted in the introduction of several new vat dyeing methods.

1. A recent development is a method of application of padding the pigment vat color, drying, and then passing through a small bath of hydrosulfite and caustic reduction, by padding; run into air free steam at atmospheric pressure in a steam ager. To be described are other methods of vat dyestuff application which are similar to the above prescribed method and are adaptable to the present installed equipment. Very few changes will be necessary to handle the dyeing by these processes.

2. Another method of padding reduced vat dyestuffs is development by soda ash and hydrosulfite on a continuous reel machine. This is a new method of dyeing by developing in the rope form. This type of dyeing can be accomplished on numerous fabrics adaptable to continuous processing.

3. The new application related to yarn dyeing is also to be covered, including the processes that have been developed and are associated with this type of dyeing.

These have potential value in adaption to civilian use in the postwar period. The new developments of vat dyeing have also admirably fitted into the picture of procurement of vat dyeing items required by the Armed Forces.

2. *Some Aspects of the Degradation of Cellulose*

Henry A. Rutherford and Milton Harris
Research Laboratories of the Textile Foundation at the National Bureau of Standards

Many cotton fabrics used by the military services are given protective coatings or treatments and are subsequently exposed to conditions which result in a degradation of the fibers and a decrease in useful service life of the fabric. The types of degradation most commonly encountered are hydrolytic, oxidative, and microbiological. Hydrolytic degradation as produced by the action of acidic substances, involves a random scission of the cellulose molecules and is directly revealed in a loss in strength and in an increase in cuprammonium fluidity. Deterioration by oxidation and microorganisms is more complex and the damage may or may not be revealed by a loss in strength and a corresponding increase in fluidity. The nature of these degradation reactions is discussed in detail.

3. *Pigments—Their Use in the Textile Industry*

Alfred N. Henschel
Asst. Technical Director, Chemical Research Division, United Merchants and Manufacturers Management Corp., Technical Laboratory, New York

The subject will cover the historical aspect of pigments and past application to textiles; attempts at improving pig-

ment dyeing and printing processes; pigment dyeing and printing processes now being used; prewar, current, and postwar uses of pigment processes. Slides, samples of pigments, and specimens of various mediums for printing and dyeing will be shown.

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1. *New Developments in Drying Cotton Piece Goods*

C. Norris Rabold
Chief Chemist, Union Bleachery, Greenville, S. C.

It is planned to discuss in this paper, modern drying machines and methods. The use of steam heat, radiant heat and infra-red rays for drying will constitute a large portion of the paper. Equipment for utilizing these drying agencies such as lamps, burners, ovens, hot flues, tenters, cans, etc., will be explained. The paper will attempt to point out the advantages of certain methods for given drying conditions such as heavy and light-weight fabric drying, resin application, drying of Sanforizer blankets, etc.

WOOL GROUP

1. *Wool Dyeing—Effect of Variations in Wool*

R. H. Kienle, G. L. Royer and H. R. McCleary
Calco Chemical Division, American Cyanamid Co., Bound Brook, N. J.

The final results obtained in the dyeing of wool are dependent upon previous history as, for example, the biological and atmospheric conditions to which the wool is exposed and the physical and chemical processes which it undergoes. Quantitative exhaustion studies and microscopical examinations are useful in determining the extent of the change which has taken place in the wool.

Some of the natural variations in wool that have been studied are: quality, source and light exposure. Some of the processes which have been studied are: scouring, neutralization, carbonization, fulling, shrinkage control treatments, chemical modification and chemical pretreatments.

It will be shown that each of these variations has its own individual way of affecting the wool which, in turn, influences dyeing.

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2. *Continuous Indigo Dyeing of Wool Stock*

Werner von Bergen
Forstmann Woolen Company

Continuous indigo dyeing has been successfully done for a number of years—continuous stock dyeing is just about one year old. Its present use is in dyeing wool for the Navy 16-ounce Melton and 30-ounce Kersey with 100 per cent indigo.

The paper discusses the historical background, describes the machine and the dyeing procedure used. The main advantages of the process are high production, low labor cost, combined with the preservation of the wool fiber to such an extent that the yarn and piece strength equals that of undyed material.

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3. *Shrink-Resistant Treatments of Wool for Military Use*

Capt. Harry F. Clapham
Military Planning Division, Q.M.C.

A discussion of the development of shrink-resistant treatments for Army woolens which will be largely confined to the results obtained on socks, wool, cushion sole, although the desirability of such treatments for other Army woolen fabrics will be included. A comparison will be made showing the advantages of treated over untreated socks under field and laboratory test conditions. The experience of the Quartermaster Corps with the various classes of shrink-resistant treatments that have been proposed will be discussed.

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4. *A Theory of Wool Felting and its Prevention*

Milton Harris
Research Laboratories of the Textile Foundation at the National Bureau of Standards, Washington, D. C.

Many properties of hair fibers such as scaliness, fineness, extensibility and recovery from extension, tendency to curl, as well as others, have been claimed to be related to their felting ability. The tendency to curl appears to be a property which deserves more emphasis in this connection than it has been heretofore given. Structural features of hair fibers which may influence this curling tendency, as well as the effect of various preventive treatments on it, will be discussed.

FINISHING GROUP

1. *A General Survey of New Resinous Materials and Their Effects on Various Fibers and Fabrics*

Donald H. Powers
Monsanto Chemical Company

Developments in the field of resin modifications of textile fibers and fabrics are progressing along two lines—

1. The treatment of fibers and fabrics with solutions of "resin-formers" which are converted into the resin itself after impregnating the fiber.

2. The surface coating of fibers or fabrics with the polymerized resin from solvent, water dispersion or from friction calender.

New resins of both types are finding war application on nylon, the strong rayons, wool and cotton.

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2. *Hosiery Finishing and Related Processes*

E. J. Siegrist
Holeproof Hosiery Co.

This will be a discussion of the purposes of hosiery finishing. It deals with the results we hope to bring about, and the means presently at hand for accomplishing these results. Materials now being used, such as dullers, softener, stiffeners, splashproofing agents, resins, and plasticizers, as well as the results of application of such materials to the various fibers is also considered.

The importance of controlling the method of application is also discussed, particularly stressing the value of the finishing laboratory. Finally the future and the products of the future as related to hosiery flushing will be outlined.

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3. *Problems in the Nature and Control of Tropical Deterioration*

William H. Weston
Harvard University

The factors that have resulted in severe and widespread deterioration of materials under tropical conditions are noted; the part played by molds and other microorganisms is discussed; the problems involved in the distribution, nature, and behavior of the fungi concerned are outlined.

The complexity of the collaborative and competitive interactions between organisms involved is discussed in relation to the major problems to be met in practical work toward effective control.

The borderline nature of the general field of tropical deterioration is stressed and its ramifications into other areas are noted; the resulting necessity for cooperation between governmental, industrial, and institutional agencies working in related fields is emphasized; needs that should be met are outlined and possible lines of attack suggested.

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4. *Water Impedant Treatment and Retreatment of Clothing Fabrics*

Lt. George P. Fulton
Bureau of Supplies and Accounts, Navy Department, Washington, D. C.

This paper presents methods of cleansing garments containing water repellant fabrics; methods of retreating garments which have lost their repellancy through wear or cleansing process; types of fabrics used for water repellant treatments; and a general brief discussion of evaluating water repellants.

SYNTHETIC FIBERS GROUP

1. *A Survey of Synthetic Fibers*

William D. Appel

President, A.A.T.C.C., Chief, Textile Section, National Bureau of Standards

The importance of the synthetic fibers to the war effort and the contributions they will make to post-war textiles is the direct result of their unique properties. These properties are summarized as a background for the discussion of the utilization of the fibers. The dimensions, surface characteristics, physical, chemical, and biological properties of the fibers are compared. The wide range in properties and adaptability of the synthetic fibers are stressed.

2. *Synthetic Fibers in Military and Post-War Fabrics*

H. W. Rose

Coordinator of Research, American Viscose Corp., Marcus Hook, Pa.

Synthetic fibers are helping to wage war, and they promise to assist also in waging peace. In military fabrics they are filling voids when other fibers are lacking, they have aided conservation in economic welfare, and they have met technical requirements and specifications which are new and unique. Indications for the future are that they will continue to create employment and afford new materials for industry and for the citizens' enjoyment of life.

3. *A Survey of the Dyeing of the Synthetic Fibers*

Arthur W. Etchells

Supt. of Dyeing, Hellwig Dyeing Corp., Philadelphia, Pa.

A resumé of some of the problems which beset the practical dyer of fabrics made of synthetic fibers.

Among the subjects covered are the methods used to overcome the gas fading of acetate; the dyeing of acetate with faster colors; the dyeing of nylon with various types of dyes; the dyeing of Vinyon and Vinyon E; Aralac and Fortisan, or duPont's Fiber B, plus some mention of the newer methods of dyeing viscose type rayon.

4. *Use of Synthetic Fibers in Knitted Fabrics*

C. W. Bendigo

Assistant Editor, "Textile World"

New yarns, yarn treatments, and new phases of knitting are all factors in using synthetics in knitted fabrics.

Covering the first, the status of the knitting yarns of the nine larger synthetic yarn producers will be summarized with emphasis on new yarns or new developments.

Yarn treatment for knitting is of major importance to full-fashioned knitters but recent improvements have also been made on finishes for other types of knitting, and more is known concerning the influence of finishes and treatments.

The newer phases of knitting are, principally, faster and finer gauge machines (circular knitting, warp knitting and flat-bed filling knitting) which made particular demands on synthetic yarns.

SATURDAY AFTERNOON SESSION

Paper No. 1

A Suggested Method for the Thorough Testing of Antiseptic Fabrics

Louis C. Barail, M.D.

Chief Bacteriologist, United States Testing Company, Inc.

The interest of manufacturers of knitted and woven fabrics in antiseptics capable of rendering these fabrics permanently bacteriostatic and germicidal has been greatly increased during the past two years. Many compounds have been tested for this purpose; inorganic compounds, organic compounds, metallo-organic compounds, but very few of them could meet the two principal requirements set up by textile manufacturers, namely, very low toxicity and resistance to multiple washings.

The author presents a method which gives full information about the value of these compounds, as far as bacteriostasis, fungistasis, germicidal and fungicidal values are concerned. Preliminary tests also deal with toxicity, skin irritants, and permit a quick elimination of harmful products.

The results obtained definitely show the advisability for textile manufacturers to use this method for testing antiseptic compounds in order to get the best results at the lowest cost.

Paper No. 2

Elimination of Kier or Jig Scouring by Alkaline Steaming

G. P. Vincent, A. L. Dubeau, John F. Synan, R. L. Carr, E. G. Fenrich, and H. R. Dinges

The Mathieson Alkali Works, Inc.

Plant scale experiments indicate that alkaline steaming is the critical step in any continuous steaming process. Steamer scouring, which eliminates kier or jig scouring, prepares any type of cloth so that it may be bleached by any conventional method or dyed in any shade that normally requires an unbleached bottom.

Experiments using a new open-width conveyor-type steamer demonstrate that a steamer may be used for any bleaching process as well as for scouring.

Paper No. 3

Shrinkage and Felting Control of Wool

J. Edward Lynn

American Cyanamid Company, Stamford Research Laboratories, Stamford, Conn.

The use of resins offers the most promising method of controlling wool shrinkage and felting during laundering from the viewpoint of ease of application, damage to fiber, and reproducibility of results. Melamine base resins have given the best results to date.

An outline is given of the application of techniques and equipment, along with the results obtained in mill runs. The theoretical aspects are briefly discussed.

TEA FOR LADY GUESTS

JAMES DIXON, Chairman of the Ladies' Committee for the Annual Meeting in Atlantic City, has announced that an entertainment and tea will be held for lady guests on Friday, October 13th, at 4 P.M. in the Solarium of the Claridge Hotel.

PROGRAM COMMITTEE, N. Y. SECTION

COMDR. W. F. PRIEN, SC, USN, chairman of the technical program committee of the New York Section, has

W. F. Prien

announced that the following will serve as members of his committee during the 1944-45 season:

Dr. Donald Price, Vice Chairman, Interchemical Corp.; C. W. Patton, Vice Chairman, Carbide & Carbon Chemicals Corp.; C. E. Dorn, J. C. Penney Co., Inc.; Henry E. Millson, Calco Chemical Division, American Cyanamid Co.; Dr. W. E. Coughlin, Good Housekeeping Inst.; Arthur Wachter, American Viscose Corp.; Dr. H. H. Mosher, Onyx Oil & Chemical Co.; Frank Stutz, Better Fabrics Testing Bureau; F. S. Richardson, Waldrich Co.; Patrick J. Kennedy, E. I. du Pont de Nemours & Co., Inc.

The subject for the first meeting, November 17, 1944, will be a symposium on "Recent Developments in Synthetic Fibers and their Uses in Fabrics." Speakers and meeting place will be announced later.

Other symposium will be conducted at the meetings scheduled for January 12, 1945; March 16, 1945, and May 18, 1945.

THE ESTIMATION OF DYESTUFFS

(Continued from Page 408)

dyes the region of absorption is in the far blue and occupies only a small proportion of the whole spectrum. Further, this region of the spectrum is of low visual brightness (Fig. 2). The effect of the absorption on the total brightness, therefore, is small, and a considerable increase and corresponding increase in concentration are required to produce a visible effect. The purity or depth of color is also a guide in making a match, but as the eye is less sensitive to changes in purity than to changes in brightness, the change in brightness is the main factor governing the accuracy. These remarks apply in a lesser degree to other dyes having sharp bands in different regions of the spectrum.

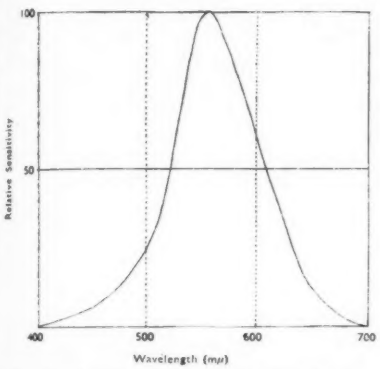

Fig. 2—Sensitivity curve of normal eye

A further disadvantage in this type of visual instrument is that, if a slight shade difference exists between the standard and the sample being measured, the matching is rendered much more difficult and accuracy suffers. Nevertheless, bearing these imperfections in mind, this method still represents the simplest and most economical means for the colorimetric estimation of dyes.

The obvious step to take in improving such instruments is to isolate the particular region of the spectrum where the dye is absorbing, and so obtain maximum visual difference for a given increase in concentration or thickness. This improvement is embodied in the Leitz Absolute Colorimeter and is the basis on which the Hilger Spekker and numerous other photoelectric absorptiometers function. Incidentally, the term "absorptiometer" or "color comparator" is more correct than "colorimeter" for these types of instruments.

The region of maximum absorption of the dye is isolated by means of glass or gelatin filters which may divide the spectrum into five or more bands, according to the instrument.

In the Leitz Absolute Colorimeter, which is a visual one, a special grey solution is also supplied which has a standard density at a given concentration. By comparison against this solution, the absolute value of the absorption of any other solution may be determined. This value, of course, will be the mean absorption over the region transmitted by the filter. Because of this, the relationship between the density recorded and the concentration of the solution being measured will not always be perfectly linear. This deviation from linearity will depend upon the sharpness of the transmission band of the filter employed and upon the sharpness of the absorption band of the dye being measured. The maximum disparity will be caused when the absorption band of the dye falls in the region of overlap of two adjacent filters and may cause a small hue difference to appear between the two fields of view.

The Hilger Spekker absorptiometer is a photoelectric instrument operating on similar principles to the Leitz Absolute Colorimeter. In this case photocells take the place of the eye, no visual comparison being made. The absorptions of the dye solutions are measured individually with reference to a variable shutter graduated in optical density. The instrument is shown diagrammatically in Fig. 3, and is operated as follows—The dye solution, placed in an optical cell, is interposed between the first photocell and filter-light combination. Simultaneously, light from the same source passes through a second filter and falls on a second photocell fitted with an iris diaphragm. A compensating water (or solvent) cell is also placed in front of the second photocell to protect it from heat and make the light falling on each photocell equal in quality. The two photocells are connected to a galvanometer acting as a null instrument, so that the galvanometer reads zero when the light flux falling on each cell is equal in intensity. The iris diaphragm is then adjusted until the galvanometer reads zero, the dye solution is removed and a second cell containing the solvent only is placed in front of the first photocell. Finally, the cells are once more balanced, this time by operating a second diaphragm, graduated in optical density, placed in front of the first photocell. In effect then, the dye solution has been replaced by a graduated diaphragm and the absorption of the dye is thus measured. As the Hilger Spekker absorptiometer is employed as a null instrument, any fluctuations in the emission of the lamp are cancelled out. Just as in the case of the Leitz instrument, because monochromatic light is not employed, the relationship between the density recorded and the concentration of the unknown solution is not necessarily linear. It is therefore advisable to prepare calibration curves for the dye being measured and, as far as possible, to operate the instrument on the linear portions of such curves. In many fields of work, when once a calibration graph has been prepared, the employment of a reference standard is unnecessary when further determinations are being carried out, the concentration being obtained from the calibration curve. The use of a comparison standard, however, is to be recommended with dyes, and it is the practice at Blackley to do so.

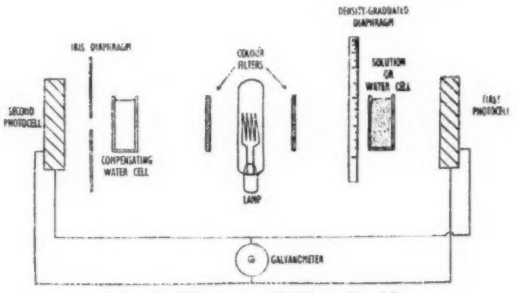

Fig. 3—Diagram of Hilger Spekker Absorptiometer

The last in this series of optical instruments used for dye estimation is the spectrophotometer. This is a truly absolute instrument, capable of measuring the absorption of a solution over the whole of the visible spectrum at intervals of down to 2 mμ. In the spectrophotometer, light from a "point-o-lite" arc lamp is split into two beams, one of which passes through the dye solution and the other through the blank cell. These are then polarized at right-angles to one another and passed together through a common nicol prism which is rotatable by means of a hand control. The two beams next pass into an ordinary spectroscope and are spread out into two spectra, one above the other, and are observed in the eyepiece. By means of

a shutter, the particular region of absorption of the dye is isolated and the two fields of view matched by rotating the nicol prism. The optical density of the solution is then read off directly from a graduated scale attached to the nicol prism mounting, and in this instrument, since monochromatic light is used, the readings are directly proportional to the concentration of the solution. The spectrophotometer, however, is a fairly expensive piece of apparatus, designed for a much wider field of application than the mere quantitative estimation of substances. Consequently, it is more complicated than the absorptiometer or simple color comparator and less suited for use by unskilled operators, so that the increased demand for quantitative estimations of dyes has resulted in more attention being paid to such instruments as the Hilger Spekker absorptiometer, which are built solely for this type of work. The spectrophotometer, however, is unique as a reference instrument where absolute density values are required. With a spectrophotometer, the optical density of a given solution of a standard can be checked from time to time, if it is suspected that the standard itself is undergoing deterioration. The density values obtained on instruments using filters may be subject to variations due to variations in the filter transmissions.

(b) Colorimeters—A different type of optical instrument which has found some application in the estimation of dyes is the Donaldson or Guild type of trichromatic colorimeter. The method involved has found more use in the direct estimation of dyes on dyed fabrics rather than in solution, but the basic principles are the same. The color co-ordinates of a pattern or solution are determined for varying concentrations and plotted on a chromaticity diagram. A curve is thus obtained moving outwards from the white point as the concentration increases. The concentration of an unknown solution or pattern is then determined by measurement of its color co-ordinates and reference to the graph. Similarly, the lightness may be plotted against the concentration and determinations made from the lightness factor. The lightness is the total visual light reflected expressed as a percentage, a perfectly white surface having a value of 100 per cent.

For solutions this method is hardly practicable, since it has no advantage over other methods and several disadvantages are apparent, e.g. the non-linear relationship between brightness and concentration and the small effect on the brightness produced by variations in concentration.

This method, however, has proved very useful for estimating colorless solutions of fluorescent dyes, especially when the solution itself is non-fluorescent. Fluorescent dyes absorb ultra-violet light and Beer's Law holds for monochromatic light of this kind. Hence, if the standard illuminant is replaced by an ultra-violet source and a fluorescent screen is placed in the pattern holder, the visible radiation caused by the ultra-violet light may be measured and the brightness calculated. On interposing a cell containing a solution of the ultra-violet absorbing compound, the intensity of the ultra-violet light reaching the fluorescent screen is diminished, the fluorescence is decreased and a lower brightness figure obtained. Under these conditions, using a mercury arc source, the illuminant is sufficiently monochromatic to render the relationship between concentration of solution and density (or log of the reciprocal of the brightness) of the fluorescent screen a linear one. Experience has shown that the accuracy of the measurements is about 5 per cent. The fluorescent screen, for maximum efficiency, should exhibit radiation of a high order and occurring in the spectral region of maximum sensitivity, so that variations in the concentration of the absorbing solution produce the maximum visual effect. A screen which fluoresces green or yellow is suitable. Actually, Rhodamine B dyed on wool is satisfactory for this purpose, giving an intense yellow-orange fluorescence. This method has recently been discarded, because mercury vapor lamps are now available for use with the Hilger Spekker absorptiometer and the absorption of fluorescent solutions can be measured directly, the photo-cells being sensitive to ultra-violet radiation.

Another type of trichromatic colorimeter which has found use in the estimation of dyes is the Lovibond Tintometer. This instrument is a subtractive colorimeter employing graded colored-glass slides in the three primary colors. These are made so that the addition of equal quantities of the three colors produces a neutral grey, and the slides are graded in depth so that each successive step of the same color differs from the previous one by a constant amount in optical density. The slides are thus additive, e.g. Red slides (3) and (5) together are equal to Red slide (8). For simplicity and accuracy the slides are made in whole units with one set of 10 in tenths of a unit. In using this instrument for quantitative estimations, a calibration curve is prepared by plotting dye concentration against the number of units of the color slide having the highest figure. The concentration of an unknown solution may then be determined by reference to the graph. The faults of the normal comparator are still present in the Tintometer, but there are certain advantages, of which the most important is that the slides are made of colored glass and, therefore, possess great permanency. Because of this, the readings obtained can be employed as a semi-absolute reference standard over long periods and the use of a solution standard for comparison is unnecessary. For this purpose, however, it is essential to standardize the conditions of illumination, because, if the dye has an appreciably different spectral absorption curve from that of the Tintometer match, the match will differ with the change of illuminant. Another advantage is that, since the slides are graded in steps of equal optical density, the curve of concentration against Tintometer unit is always fairly shallow and often practically linear, provided that the concentrations of the dye solution are of a low order.

ESTIMATION OF DYESTUFFS ON THE FIBER

The direct estimation of dyes on the fiber is a difficult process which can only be carried out with colorimeters such as the Guild or Donaldson and the Lovibond Tintometer; a spectrophotometer may also be used if fitted for reflection measurements.

In the case of the colorimeter, the color of the pattern or fibers suitably mounted is measured, and the results plotted on either a chromaticity chart or a lightness-concentration graph, the quantity of dye present being estimated by reference to a graph prepared from patterns of known depth and composition of shade. For the same reasons quoted in connection with the measurement of dye solutions, this method is unsatisfactory and would not be used except where other methods fail. Greater accuracy could be obtained by the employment of powerful monochromatic illuminants, but, as these are not made in a wide range, this would be impracticable. The application of this method has proved successful in following the effect of fading where the surface concentration only is to be estimated.

No known relationship exists between the light reflected from a pattern and the quantity of coloring matter present, so the density measurements obtained on the spectrophotometer, when used for reflected light, are no longer proportional to the concentration of the dye. It is therefore necessary to prepare a calibration curve by plotting the optical densities of patterns of known dye concentration, and, by reference to this, the concentration of an unknown pattern may be estimated.

The usual method employed in the estimation of a dye on the fiber involves extracting the dye with a suitable solvent, or dissolving both fiber and dye and estimating the solution colorimetrically. In general, the methods employed are the same as those already described for estimations in solution, and the very important question of the nature of the solution

must now be discussed. In the preceding discussion the solutions were assumed to behave ideally, but in practice this is not true and the discrepancies are probably the main source of trouble. The majority of dyes are colloidal in nature and in some solutions tend to aggregate or associate. This tendency is increased by the presence of salt or other ionic substances and by the practice of carrying out most colorimetric estimations with cold solutions. When a dye is aggregated in solution Beer's Law is not always obeyed, for an increase in concentration does not produce the same effect as a corresponding increase in the thickness of solution. It is essential that this should be borne in mind and the conditions adjusted so as to reduce aggregation to a minimum. A good solvent and the employment of dilute solutions are to be recommended. It is also advisable to check the linearity of the relationship between concentration and density with thickness of solution when examining a dye for the first time, and, indeed, at any time when there is any doubt. The majority of soluble dyes may be satisfactorily measured from an aqueous solution, but it is often better to use a solvent such as 25 per cent aqueous pyridine, particularly with some of the direct cotton dyes. Dimethyl formamide is also a satisfactory solvent for acid dyes and direct dyes, and has been used successfully in the case of milling acid dyes which have very poor solubility in cold water, e.g. Coomassie Red PG. The use of warm solutions also reduces the possibility of aggregation and, if care is exercised, is a simple method where other suitable solvents are not readily available. The dispersed cellulose acetate rayon dyes are all soluble in acetone and present no difficulty, as they may be measured in this solvent.

Vat dyes are more troublesome and originally required the use of concentrated sulfuric acid as solvent, but experience has shown that *o*-chlorophenol is a much better solvent, gives cleaner and brighter solutions and does not appear to react with the dyes, since the color remains the same in solution as in substance. Sulfuric acid often changes the color of a dye and, in certain cases, due to traces of impurity, has been observed to destroy the dye. Further, there are more yellow-colored solutions obtained with sulfuric acid as solvent, the yellow dyes remaining the same color after dissolving, while some dyes of other colors are changed to yellow when dissolved. Since yellow is the most difficult color to estimate colorimetrically, this color is undesirable. *o*-Chlorophenol suffers from the disadvantage of being corrosive and precautions must be taken; ethyl alcohol quickly applied to splashes on the skin is effective in preventing injury.

The sulfur dyes as a class are probably the most difficult to estimate, for no simple solvent can be employed. The use of sodium sulfide and sodium carbonate solutions has proved generally applicable when slightly modified for individual dyes, and satisfactory results have been obtained. After dissolving, it has been found necessary in many cases to add a small excess of hydrogen peroxide to the solution at the final dilution in order to decompose the sodium sulfide. The dye is then probably present in the oxidized form as a very fine colloidal dispersion, but still remains optically clear. Such dispersions obey Beer's Law over considerable concentration ranges and, indeed, much coarser dispersions, if regular, also satisfy Beer's Law. It is most important with sulfur dyes that the technique of operations should be of a high standard, as less latitude is permissible with this class of dyes. The density of the final solutions is dependent in some measure upon the technique of preparation.

The particular method used in the case of dyed fibers, therefore, is largely governed by the type of dye present on the fiber and by the ease of stripping or dissolution. The method of complete dissolution of the fabric and dye is not always applicable, but may be used for dispersed dyes on cellulose acetate rayon when acetone is the solvent, for dispersed dyes on nylon when *o*-chlorophenol is the solvent, and for vat dyes on cotton when cold 80 per cent sulfuric acid is the solvent. In this method it is essential to employ in the blank cell a solution of the undyed material. Where pigment-delustered material is employed, the absorption of a blank solution will be high, and this absorption should be calibrated separately and subtracted from the observations on the dyed fabric.

Direct dyes on cellulose and acid dyes on wool may be readily extracted with aqueous 25 per cent or 50 per cent pyridine. Extraction methods are quite satisfactory for the majority of dyes and only in a few cases is it difficult to extract the dye completely.

Sulfur dyes are not extractable by any method suitable for direct determination and the amount on the fiber can only be determined indirectly. For instance, in determining such properties as rate of dyeing and exhaustion values, the quantity of dye on the fiber may be determined by estimating the residual dyebath and subtracting from the total quantity applied. Two possible direct methods not yet critically examined are dissolution with concentrated sulfuric acid and extraction with dimethyl formamide, for preliminary tests suggest that the latter may have some solvent action on sulfur dyes.

The latest development in the determination of dyes is a specially constructed piece of apparatus[2] used in the Dyehouse at Blackley and designed for continuous measurement of the rate of dyeing throughout the dyeing process (Fig. 4).

This apparatus functions in a similar manner to the photoelectric absorptiometers, the concentration of the dyebath being measured with a photocell-filter combination and recorded continuously during dyeing by a sensitive galvanometer. The concentration at any time interval may thus be noted and plotted.

The considerable attention which has been directed towards the quantitative estimation of dyes, both in solution and on the fiber, has resulted in a greatly increased knowledge of the dyeing properties of dyes. With the development of machine dyeing and rapid production methods the demand for this knowledge is increasing, and it does not require much imagination to visualize processes in the future being automatically controlled by colorimetric methods, the use of sensitive photoelectric instruments enabling production to be both continuous and rapid.

The author thanks Imperial Chemical Industries Ltd., Dyestuffs Division, for permission to publish this paper.

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[1] Trotman, this Jour., 1931, *47*, 344.
[2] Davenport, "J. Sci. Instruments," 1944 *21*, No. 5, 84.

DISCUSSION

The Chairman (G. M. Williams) asked if the work described referred only to single dyes, or could it be applied to mixtures of dyes?

The Lecturer replied that it depended upon the particular dye combination used. Taking the simple case of a blue and yel-

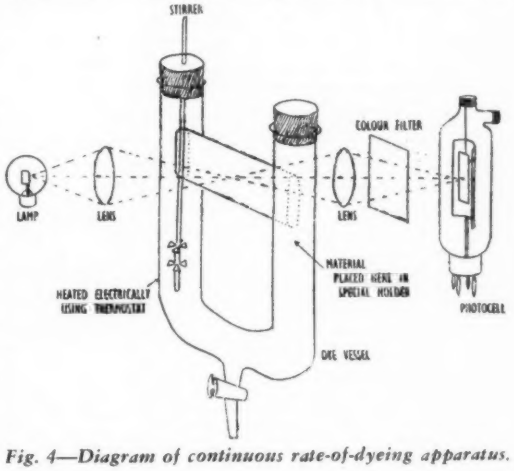

Fig. 4—Diagram of continuous rate-of-dyeing apparatus.

low mixture, then, by using the Hilger Spekker absorptiometer with the appropriate filters, both components could be estimated directly. In this case the absorption of a yellow dye would occur only in the wave-length region below 500 $m\mu$. As the blue dye would not absorb light in this region, the absorption of the yellow dye could be measured separately using a blue filter. Similarly, the blue dye would have an absorption curve in the red end of the spectrum where the absorption of any yellow component is zero and so the blue dye could also be estimated separately using a red filter.

In the case of a three-color mixture, or a less simple two-color mixture, the absorption curves of the components might overlap and the readings obtained for one component using the necessary filter would be modified by the additional absorption of the other components. Nevertheless, provided this additional absorption had been calibrated by separate measurements, allowance could be made for it in the mixture. This involved the use of three algebraic equations or a calibration chart and, therefore, was more tedious.

F. Crompton asked whether, in the case of the continuous rate-of-dyeing apparatus (Fig. 4), the amount of dye and the amount of material to be dyed bore any relationship to commercial practice. To him it seemed as though there was a large dyebath with only a small amount of material being dyed. In general practice there was a large amount of material and a small amount of dyeliquor. He also mentioned that commercial dyebaths became very dirty, usually due to impurities in the cloth, and asked how this would affect the test?

The Lecturer said that the ratio of material to dyeliquor could be varied within certain limits and that generally a ratio of 40:1 was used. With regard to the question of dirt in the dyebaths, this problem had not been encountered in laboratory tests, due, no doubt, to the easier control over laboratory conditions, but a cloudy or dirty dyebath would give a false reading on the galvanometer if the cloudiness developed during the dyeing process. This trouble could be obviated by using a filtering system in the machine.

Mr. Crompton, referring to the reflection measurements and the amount of dye on the fiber, asked what difference would be obtained when testing a calendered piece of material as compared with an uncalendered one?

The Lecturer said that this depended upon the conditions of measurement, and that, under normal conditions of illumination at 45° and viewing at 90°, the uncalendered material would appear a little weaker when measured on the colorimeter. It would be unlikely that measurements usually carried out on a colorimeter would involve the estimation of strength on different materials. If this were necessary, then it might be possible to overcome this difficulty by wetting the fabrics and so reducing the difference due to surface treatment.

Dr. H. A. Thomas said that the Lecturer had mentioned that, if a spectrophotometer was used for the purpose of estimating dyes on a dyed fabric, considerable difficulty was experienced because frequently the source of light was not sufficiently bright or the fabric surface was not sufficiently reflective. Apparently the human eye was not capable of making accurate measurements under such conditions. Some years ago, Toussaint invented an arrangement which he called a photocolorimeter. He used six color filters in order to cover the whole of the visible spectrum. The light from the source was permitted to pass through each of these filters, one at a time, and then fall on to the colored surface. The percentage reflection from the surface of the dyed fabric was then measured by means of a photoelectric cell and galvanometer. Thus, a picture could be drawn from each of the six color filters of the reflection of the fabric over the whole of the visible spectrum. He understood that it was claimed that reasonable accuracy in matching a pattern could be achieved with the instrument. Knowing the reflection diagrams for fabrics dyed with each of three individual dyes normally used together for matching a shade, the three diagrams could then be added together, as it were, in order to build up the shade obtained by a mixture of the same three dyes.

It was claimed that the reverse method could be adopted, viz. to determine the diagram for the shades to be matched and then work out from the reflection diagram the percentages of the three dyes required to match the shade. Bulk dyeing was proceeded with, employing the calculated recipe. He understood that this had been successful in dyeing wool with a standard mixing of three dyes. Did the Lecturer consider that this was a reasonable claim to make and that it would be feasible to apply the method in future to the dyeing of all fibers using various mixtures of dyes?

The Lecturer said that this method of match prediction was possible and could probably be carried out with a Hardy spectrophotometer. He was rather skeptical about it being done with an instrument using only six filters. Further, a large number of calibration curves would be necessary to make an accurate calculation of the additions of dye necessary to produce a required effect. This was due to the fact that the reflection curves obtained by the instrument did not bear a simple relationship to the concentration of dye on the fiber. Although he had not had any experience with this instrument, he doubted its practical value for this purpose and considered that at least eight or nine filters would be required for even moderate accuracy in the measurement of reflection curves. A more recent development in spectrophotometric instruments, of possible use for match prediction, was the Snow-Duplex instrument which, instead of drawing the reflection curve on paper, as in the case of the Hardy instrument projected the curve on to a cathode-ray screen similar to those used in television reception. It was also equipped with a double beam so that two curves could be projected simultaneously for comparison on the same screen. This instrument had been developed in the United States, but was not commercially available.

Dr. Thomas said that Toussaint's device was claimed to be useful when dealing with three dyes covering a wide range of shades and did not need much mathematical calculation. Square block diagrams were obtained and superimposed by means of translucent paper and the necessary alterations calculated.

The Lecturer said that, in his opinion, although such color prediction was possible in theory, no instrument yet available was sufficiently simple or speedy in operation to replace the present method of color matching.

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Abstracts of Some of the Papers Presented at New York, N. Y., September 11 to 15, 1944

CHEMICAL CHARACTERIZATION OF RAYON YARNS AND CELLULOSIC RAW MATERIALS. C. C. Conrad and A. G. Scroggie, Rayon Department, E. I. du Pont de Nemours & Co., Richmond, Va.

Modifications to the HCl-$FeCl_3$ hydrolytic and catalytic oxidation method developed by Nickerson, [Nickerson, R. F., Ind. Eng. Chem., Anal. Ed. *13*, 423-426 (1941)], are described. The modifications include changes designed specifically to reduce superheating and minimize fluctuations in boiling point arising from variations in barometric pressure. A reduction in the variability of CO_2 evolution rates and an improvement in reproducibility are obtained with the modified apparatus.

Suggested empirical, alternate methods for calculating the accessibility of cellulosic materials from CO_2 evolution data are described.

Certain features of the reaction between glucose and HCl-$FeCl_3$ have been studied. These studies reveal that the reaction is characterized by an induction period in which small amounts of CO_2 are produced at a steadily increasing rate, suggesting the formation of an intermediate product on which the evolution of CO_2 is dependent. The reaction between HCl-$FeCl_3$ and glucose is not complete in 50 hours. An abrupt change in rate at about one mole of CO_2 per mole of glucose occurring after 10 hours' reaction suggests the completion of a comparatively rapid reaction evolving one mole of CO_2.

Data on the accessibility of rayon-grade cotton linters and wood pulps based on the HCl-$FeCl_3$ reagent are presented. In most cases, the accessibility decreases with increasing alpha-cellulose content.

The accessibility of a number of regenerated cellulose yarns is presented. These values reveal little or no dependence of accessibility on such factors as orientation or fiber tenacity.

A high degree of correlation between the accessibility or regenerated cellulose yarns and crystallinity as calculated from intensity measurements of x-ray diffraction patterns has been obtained in this investigation. The accessibility decreases with increasing crystallinity, substantiating to a certain degree the contention that the accessibility measurement is chiefly a measure of amorphous cellulose.

EFFECT OF SYNTHETIC RESINS ON THE PHYSICAL AND CHEMICAL PROPERTIES OF CELLULOSE AND PROTEIN FIBERS. D. H. Powers, Monsanto Chemical Co.

When cellulose fibers are impregnated with resin-forming solutions of unpolymerized urea-formaldehyde, melamine formaldehyde, or phenol-formaldehyde, these resin formers have little effect on the properties of the fibers until these resins are cured or polymerized within the fiber. Evidence shows that the resin is uniformly distributed through the fiber and in certain cases may actually react within the cellulose. Low concentrations of the resins formed within the fiber have pronounced effects on the physical properties, changing the elongation, elasticity, wet strength, moisture regain, resilience, and dyeing properties. A new method of determining the degree of resin polymerization has been developed.

It is also shown that wool and protein fibers may be impregnated with resin-forming solutions; however, there is no evidence that they react with the wool protein. The medium in which the resin-forming materials are applied has a tremendous effect on the properties obtained, and it is shown that fiber swelling is necessary to ensure thorough penetration. Electron photomicrographs are shown of treated and untreated fibers.

STRUCTURE AND PHYSICAL PROPERTIES OF UNDRIED COTTON FIBERS AND CHANGES OCCURRING UPON DEHYDRATION. Earl E. Berkley, and Thomas Kerr, Division of Cotton and Other Fiber Crops and Diseases, Department of Agriculture, Beltsville, Md.

Undried fibers from immature cotton bolls were found to contain little or no crystalline cellulose. They are plastic and the structure and strength can be changed greatly by stretching as shown by a reduction in the x-ray angles, and an increase of more than 100 per cent in the strength index. The strands of cellulose known as fibrils are present in the undried fibers. The cellulose molecules in these areas are arranged essentially parallel with each other when deposited from the protoplasm, and crystallization takes place readily if the fibers are stretched or dehydrated in alcohol or other organic liquids miscible with water.

The structure of undried fibers may also be altered by impregnating them with strong solutions of glucose. Fibers impregnated with glucose and dried are plastic similar to undried fibers. Undried fibers impregnated and dried under tension show, in the x-ray diffraction pattern, the cellulose, the glucose, and a third compound all oriented in regard to the long axis of the fiber.

REPORT ON SOME RECENT PROGRESSES IN CELLULOSE CHEMISTRY. H. Mark, Polytechnic Institute of Brooklyn.

Commercial cellulose acetate was fractionated by W. Badgley in comparatively large batches by precipitation from a 2 per cent solution in acetone with methanol. The distribution curve obtained with the aid of about 60 fractions agreed remarkably well with the one previously worked out by Milton Harris and his collaborators.

Mixtures of fractions were made and refractionated. It was possible to recover the individual fractions with a fair degree of accuracy and indicates that the fractionated precipitation of cellulose acetate from a dilute solution is of good reproducibility.

Osmotic and light-scattering measurements were carried out with various fractions. The close agreement between the osmotic (number average) and light scattering (weight average) values makes it probable that the individual fractions contain a relatively narrow range of molecular weight.

The rate of exchange of the hydroxyl-hydrogen in cellulose samples with deuterium was followed by V. Frilette. All three OH-hydrogens exchange after sufficiently long time, indicating that H_2O and D_2O both can diffuse through the lattice of native and regenerated cellulose. The rate curve of the exchange is similar to the hydrolysis (Nickerson) and periodate oxidation (Goldfinger—Siggia) rate curves and suggests the existence of more easily and more difficultly accessible areas in the fiber. The slope of the part of the curve which corresponds to the slow reaction measures the rate of diffusion of (light or heavy) water through the lattice of the cellulose. From the (appreciable)

temperature dependence of this slope the activation energy of the (activated) lattice diffusion can be calculated.

In cellulose samples of different sources, such as cotton fiber, cotton linters, wood pulp, cellophane, and rayon, different rate curves of exchange are observed.

CHARACTERIZATION OF CELLULOSE DERIVATIVES BY SOLUTION PROPERTIES. H. M. Spurlin, A. F. Martin, and H. G. Tennent, Hercules Experiment Station, Hercules Powder Co., Wilmington, Del.

Nearly all thermoplastic materials are used in the form of concentrated solutions of polymer in plasticizer. The plasticizer does not differ in the essential features of its behavior from other solvents. It is shown by examples that the commercially useful cellulose-derivative plastics lie in a relatively narrow range of the system solvent-polymer, which system follows quite closely the equations found empirically by Flory and given theoretical background by Eyring. The problem of formulation of plastics is to fit one rigidly defined set of conditions at molding temperature and another set at use temperature. The temperature coefficient of each of the types of intersection present in a polymer-solvent system is thus very important.

It appears that a study of more dilute solutions of the polymer in the plasticizer will give quantitative data of use in understanding the behavior of plastics. The viscosity-concentration curves determined over a range of temperatures should give much information about interactions between polymer chains in the presence of various types of plasticizers. It should also be necessary to determine the miscibility of the fractions of the polymer with the plasticizer as a function of temperature in order to understand both the molding process and the physical properties of the plastic at room temperature.

MECHANICAL PROPERTIES OF CELLULOSE ACETATE AS RELATED TO MOLECULAR CHAIN LENGTH. Arnold M. Sookne and Milton Harris, National Bureau of Standards.

The preparation and mechanical properties of a series of cellulose acetate fractions and blends were described earlier. The number-average degrees of polymerization (DP's) of the fractions in acetone solutions have now been estimated in acetone solutions. The number-average DP's are directly proportional to the intrinsic viscosities.

$$[\eta] = \lim_{c \to 0} \frac{\eta sp}{c}$$

of the fractions in acetone solutions, in agreement with Staudinger's law and the results of Kraemer.

The tensile strengths, ultimate elongations, and folding endurances of films prepared from the fractions and blends were plotted against their number-average and weight-average DP's. When the mechanical properties are plotted against the weight-average DP's, the results for the fractions and different blends fall on separate curves. In contrast, when the mechanical properties are plotted against the number-average DP's, the results for the fractions and all of the blends fall on a single curve for each property. These results are shown to be qualitatively consistent with the hypothesis that the mechanical properties of blends are the sums of the mechanical properties of their components. The results emphasize the practical importance of determinations of the number-average DP in studying commercial polymolecular materials.

INTER-CHAIN ORDER AND ORIENTATION IN CELLULOSE ESTERS. W. O. Baker, Bell Telephone Laboratories, Inc.

A continuous series of states of short-range molecular order from amorphous to crystal-like has previously been shown to result from appropriate heat treatment, solvent action, etc., in solid cellulose esters and other linear polymers. The order-disorder proportion strongly influences physical properties of the solids, and is affected by rate of cooling during molding, by subsequent aging, etc.

These studies, aimed at describing by means of the fine structure the principal mechanical behavior of thermoplastic cellulose derivatives, have been extended to various oriented states of cellulose esters and mixed esters. These include orientation (Sisson's classification) found in fibers (uniaxial), parts of injection moldings (imperfect uniplanar, uniaxial, and biaxial), and rolled sheets (uniplanar or selective uniaxial, i.e., biaxial). X-ray diffraction was principally used to indicate structure and orientation.

The simplest operation of pressing or rolling an unoriented sample produces the lowest degree of orientation, uniplanar. At the same time, some disruption of ordered regions appears to occur during the deformation, and strained positions are occupied by some of the chain segments. These may lead to slow dimensional changes, especially in moisture-sensitive polymers. Cold pressing resembles low-temperature compression molding in this effect.

Similarly, when a highly ordered annealed fiber is cold-rolled to give a selective uniaxially oriented ribbon, local strains are introduced. Then, subsequent reordering is demonstrated by the diffraction diagrams after heat or solvent treatment. This improved local ordering is accompanied by no change, or sometimes slight increase in over-all orientation. These effects are shown particularly clearly for cellulose tri-esters and highly substituted acetate butyrates.

Detailed diagrams for doubly-oriented filaments of representative esters yield interplanar spacings, and relative intensities, which may be tabulated as reference standards to estimate the degree of order in any given sample. That is, the appearance of particular equatorial spacings (and the order of their intensities) identifies the over-all orientation in a given sample, with respect to the x-ray beam. Then, also, the poorer the local chain order, the fewer diffraction features appear for any particular orientation. The reference patterns show most features and highest order.

This identification of the states of order and orientation is essential in evaluating the results of gross physical tests on moldings, such as tensile and impact strength. Likewise, of course, the behavior of the final product is affected. For example, variable order and orientation occur along weld lines.

Increasing concentrations of plasticizer in both unoriented and oriented sections gradually causes disordering of the chains quite like that in quenched polymers.

In the mixed esters, such as the acetate butyrates, high total substitution is required, as might be expected, for high degrees of crystallinity. Lower total substitution, however, with more hydrogen bonding, tends to raise the melting point. These competing factors appear to cause the bending back toward the butyryl side of the melting point vs. composition curves of Malm, Fordyce, and Tanner. In this and all other instances, chemical composition must always be considered in predicting the physical effects of varying order in interchain packing.

THE BASIC PHENOMENA ASSOCIATED WITH IMPACT TESTING AND THEIR RELATION TO STRUCTURE AND COMPOSITION OF PLASTICS. D. R. Morey, Eastman Kodak Co., Rochester, N. Y.

Mathematical models for explaining the observed mechanical behavior of elasto-plastic bodies makes use of viscous mechanisms with various relaxation times. A discussion of such models is given, together with the various types of bonding which have different relaxation times. As the rate of deformation increases from that in long-time experiments to that in impact testing, the various types of bonds change their relative contribution to the mechanical behavior. Temperature plays an important part and may be used to study more conveniently the short relaxation times.

At the very high deformation rates, the mechanical behavior is also affected by the presence of a shock wave travelling with the speed of sound in the material. This phenomenon brings in the dimensions of the test piece and reflections from clamps. An important consideration is the steepness of the wave front and how it is smoothed out by submicroscopic inhomogeneities.

Experimental arrangements used in impact testing are critically discussed.

THE EFFECT OF THE PREPARATION OF THE SPECIMENS ON THE PHYSICAL PROPERTIES OF CELLULOSIC MOLDING COMPOUNDS. R. H. Ball, C. E. Leyes, and A. Melnychuk, Celanese Corp.

Cellulose acetate, cellulose acetate butyrate, and ethyl cellulose molding materials are transformed into finished articles principally by the injection molding process. It is, therefore, proper that injection-molded test specimens should be used in evaluating the physical properties of these materials.

In the use of injected specimens, because of the number of variables involved in this molding method, it was necessary to learn which of these variables effect the physical properties. This problem has been studied on a one-ounce laboratory injection machine, equipped with accurate controls, using tensile and impact bars as the specimens. The factors studied include main heater temperature, secondary heater (preheater) temperature, mold temperature, molding cycle, and orifice diameter of the nozzle tip.

Main heater temperature was found to be the most important factor affecting impact and tensile properties. Between the minimum temperature required to fill the mold and the maximum molding temperature, which covers a temperature span of 50° to 125° F., impact figures on a particular compound have been found to vary as much as 275 per cent, tensile strengths as much as 127 per cent, and elongation values as much as 113 per cent. This applies to all compounds studied in cellulose acetate, cellulose acetate butyrate, and ethyl cellulose. The largest spread in impact and tensile strength values due to main heater temperature occurs in cellulose acetate butyrate.

The orifice diameter of the nozzle tip was also found to have a large influence on physical properties.

Variations in secondary heater temperature, mold temperature, and molding cycle did not produce important changes in physical properties.

This study shows that impact, tensile, and elongation values determined on injection-molded specimens have little value unless the molding conditions are standardized and correlated between various laboratories.

HIGH-SPEED IMPACT TESTING OF PLASTICS. E. L. Kropscott and Paul H. Lipke, The Dow Chemical Co., Midland, Mich.

In many applications the satisfactory performance of a plastic material depends upon its ability to withstand sudden shock. The behavior of plastics when exposed to these high-speed impacts cannot be predicted by conventional low-speed tests. Costly and time-consuming performance tests are now required on every molded part. The strength and behavior of a plastic can be studied, by means of laboratory tests, at any given velocity of impact. Each plastic has a critical velocity where it changes from a tough to a brittle material. Factors which influence high-speed impact strength include temperature, shape and flexibility of the sample, velocity, and energy at the point of impact.

The impact strengths of a number of commercial plastics have been measured at various velocity levels up to 2000 feet per second. Cellulose derivative plastics are shown to have a wider range of toughness than the vinyl resins and urea-formaldehyde plastics. The effect of plasticizers, temperature, humidity, and molding conditions on ethyl cellulose plastics is also discussed.

THE WEATHER-RESISTANCE OF CELLULOSE ESTER PLASTICS. L. W. A. Meyer and W. M. Gearhart, Tennessee Eastman Corp., Kingsport, Tenn.

A comparison of the resistance of several cellulose ester compositions to outdoor weathering is presented. Compositions tested include cellulose acetate butyrate and cellulose acetate as base materials with dibutyl sebacate, triphenyl phosphate, and diethyl phthalate as plasticizers and phenyl salicylate as ultraviolet inhibitor. Effects of exposure at Phoenix, Ariz., Fort Myers Beach, Fla., and Kingsport, Tenn., are given. Physical properties considered are appearance, elongation, tensile strength, flexural strength, flow temperature, and intrinsic viscosity. Effects of exposure on properties of the plastics are correlated with climatic conditions.

Test results indicate that these compositions are subject to considerable degradation on outdoor weathering and that this effect becomes less pronounced under more temperate climatic conditions. The resistance to weathering can be somewhat improved by the proper choice of plasticizer; it can be very materially improved by adding small proportions of an ultraviolet light inhibitor such as phenyl salicylate. The addition of an inhibitor is effective for both cellulose acetate butyrate and cellulose acetate compositions but is more effective for the former. Possible reasons for this difference are discussed.

TRADE NOTES • NEW PRODUCTS

• SYNTHETIC ORGANIC CHEMICALS

In order to provide the chemical industry with recent information on production and sales of synthetic organic chemicals for 1943, the United States Tariff Commission recently issued a summary report giving statistics (preliminary) on the production and sales of synthetic cyclic (coal-tar) materials, intermediates, dyes, medicinals, plastics materials and other cyclic organic compounds, and synthetic non-cyclic (non-coal-tar) materials.

This report shows that the 1943 sales of all synthetic organic chemicals, exclusive of explosives and other chemicals produced at Government Ordnance plants or at private plants producing under Ordnance control, reached a value of 1,400 million dollars, an increase of 54 per cent over the value in 1942, and the highest value on record for such sales. Sales are considerably smaller than production because a large part of the total output is consumed in further processing by producing companies.

The quantity produced in 1943 was one-third larger than in 1942, partly as a result of the increased output of synthetic rubber (elastomers), and of its chemical raw materials.

More complete statistics of production and sales of plastics materials are given than for other items because of the special interest in the wartime development of the plastics industry. Production of cyclic plastics materials rose from 297 million pounds in 1942 to 379 million in 1943, and production of non-cyclic plastics materials from 143 million to 273 million pounds.

Copies of the summary report may be obtained from the United States Tariff Commission, Washington 25, D. C., or from the Commission's office in the Custom House, New York 4, N. Y.

The Commission plans to release, at a later date, a more detailed report on production and sales of synthetic organic chemicals in 1943.

SUMMARY REPORT ON PRODUCTION AND SALES OF SYNTHETIC ORGANIC CHEMICALS IN THE UNITED STATES, 1943

Synthetic organic chemicals: Comparison of United States production and sales, average 1937-41, annual 1942 and 1943

(Production and sales in thousands of pounds; sales value in thousands of dollars)

Product	*1937-41 average*	*1942*	*1943*	*Increase (+) or decrease (—) 1943 over 1942*
Cyclic chemicals:				
Intermediates:				*Percent*
Production	679,399	1,243,754[1]	1,524,133	+22.5
Sales	286,062	697,054[1]	1,011,466[1,2]	+45.1
Sales value	42,102	93,905	133,277[2]	+41.9
Finished cyclic products:				
Production	479,187	773,296	1,398,533	+80.9
Sales	394,081	631,449	1,229,708	+94.7
Sales value	168,307	307,795	454,612	+47.7
Dyes:				
Production	124,125	151,878	143,913	— 5.2
Sales	123,962	144,847	145,392	+ .4
Sales value	75,535	99,431	105,134	+ 5.7
Medicinals:				
Production	17,815	35,840	50,550	+41.0
Sales	14,734	32,584	45,333	+39.1
Sales value	17,968	59,921	99,020	+65.3
Flavors and perfume materials:				
Production	5,792	7,956	8,120	+ 2.1
Sales	5,353	7,245	7,973	+10.0
Sales value	4,891	9,846	9,799	— .5
Cyclic resins:				
Production	199,935	297,020	378,846	+27.5
Sales	147,887	249,777	337,800	+35.2
Sales value	32,321	76,460	76,701	+ .3
All other:[3]				
Production	131,520	280,602	817,104	+191.2
Sales	102,145	196,996	693,210	+251.9
Sales value	37,592	62,137	163,958	+163.9
Non-cyclic chemicals:				
Production	3,386,021	7,202,902	9,346,228	+29.8
Sales	1,704,724	3,682,964	5,317,661	+44.4
Sales value	221,243	533,864	851,822	+59.6

[1] Includes intermediates produced from petroleum sources.
[2] Includes quantity and value of sales of intermediates reported to the Bureau of Mines.
[3] Includes color lakes, rubber chemicals, elastomers, and miscellaneous cyclic products not shown separately.

• STEIN, HALL ELECTION

Stein, Hall & Co., Inc., New York, announced the election of Edwin Stein as president, succeeding the late Frank Griswold Hall.

Morris S. Rosenthal succeeds Mr. Stein as executive vice-president, and Arthur L. Strasser becomes Chairman of the Board.

Dr. Alexander Frieden, Technical Director, has been elected a vice-president.

In addition to Mssrs. Stein, Rosenthal, Strasser and John G. Goldstein, treasurer, the Board of Directors now includes Cecil H. Coryat, vice-president of the company, and Don M. Hawley, vice-president and general manager of Stein, Hall Mfg. Co., Chicago subsidiary. Robert M. Stein is secretary.

• DU PONT ORGANIZATION CHANGES

A. Felix du Pont, vice-president of E. I. du Pont de Nemours & Company has retired as a member of its Finance Committee, it was announced after a meeting of the Board of Directors held recently. He will continue to serve as a member of the Board.

Edward B. Yancey, formerly general manager of the Explosives Department, was elected a vice president and member of the Executive Committee. Emile F. du Pont, production director of the Nylon Division and a director of the company, was elected to succeed A. Felix du Pont on the Finance Committee.

A number of additional organization changes were announced following the Board's session. Dr. Finn Sparre, director of the Development Department, who retired August 31, will retain his membership on the Board of Directors. Ernest K. Gladding succeeds Dr. Sparre as director of the Development Department. William H. Ward, assistant general manager of the Explosives Department, was named general manager succeeding Mr. Yancey.

The appointment of T. C. Davis, heretofore assistant comptroller, as an assistant treasurer to head the Treasury Division of the Treasurer's Department, was announced.

• TECHNICAL ASPECTS OF NEW TEXTILE PROCESSES

Technical considerations associated with three newly-developed textile treating processes, which grew out of research to improve GI fabrics and which are seemingly destined to have considerable effect on the postwar textile industry, were made public by the Monsanto Chemical Company recently.

Compounds credited with the ability to make sheer stockings run-resistant, remove the shine from serge suits and make fabrics longer-lived were identified as the Sytons by Monsanto. It was also announced that a unique and revolutionary process to make woolens shrinkproof, wrinkle-resistant and more durable will be known as Reslooming.

A third new Monsanto process was described as imparting water-repellent qualities to cotton, rayon and wool. As with the Sytons and Reslooming, the company said, this process does not alter or impair the original and desirable qualities of the basic fibers.

Syton treatment is accomplished through immersion, spraying or sponging—either at the mills or in the home—with what is identified technically as a fine colloidal dispersions of polymerized silica or quartz. In other words, individual fibers are coated with highly purified submicroscopic quartz dispersed in water.

These submicroscopic fibrils of quartz, with a diameter of less than 1/400,000th of an inch, form a hard and translucent film over the individual fibers, improving natural sheen, giving them added strength, precluding shine and making them less likely to slip away from their companion fibers, it is claimed.

Deposits of less than 1 per cent have reduced slippage on a wide range of fabrics by more than 50 per cent, as measured by the standard ASTM test, and higher concentrations produce correspondingly higher reductions. Among other practical results, this means seams will hold better in Syton-treated fabrics and such feminine undergarments as slips will have less tendency to creep out of place.

The Syton compound most thoroughly recommended is a neutral solution, substantially free from salts or electrolytes.

It may be diluted with water or solvents, is stable in mild acid and alkali, and is compatible with water solutions or dispersions of other finishing agents, resins or dyestuffs.

It is indicated Syton will normally be applied on a standard textile padder, then dried in the usual manner. No special precautions are necessary, and no curing or aftertreatment required. One application, it is said, may be expected to last the life of the fabric.

The third new process—as yet unnamed—likewise involves external treatment of fibers. Water-repellent qualities are imparted through application of a tough plastic, which is impervious to water and highly resistant to heat and chemicals.

The plastic used is a modified, thermo-setting melamine. It is applied from a water solution on a standard textile padder, then cured several minutes at 265 to 270 degrees Fahrenheit.

When cured it forms a waterproof film bound so tightly to individual fibers it is claimed that it will last the lifetime of most fabrics despite dry cleaning or washing. Color fastness, it is stated, is actually increased.

Reslooming, on the other hand, is said to impregnate individual fibers with a tough heat-water-and-chemical resistant plastic, minimizing shrinkage, increasing wear, and prolonging the life of a trousers' crease. The process' greatest possibilities are seen in wool; however, Reslooming also is effective on cotton, rayon, linen and aralac.

The plastic used in Reslooming and waterproofing is a member of the family known as melamines, first synthesized over 100 years ago, but available commercially in this country only since 1939. It was only this year that the special clear, colorless and water-soluble formulations used in Reslooming were perfected.

In its present stage of development, Reslooming will be done only in the textile mill, and will require only minor changes in current production methods. The yarn or fabric is spun or woven, passed through a water solution of the special melamine compound and then cured for several minutes at about 275 degrees Fahrenheit. During the process, the plastic penetrates to the heart of each individual fiber with such permanence no way has yet been found to remove it.

• NEW OFFICES, NATIONAL CARBON

Completing National Carbon Company's new sales set-up under which all company products are to be handled nationally from seven divisional offices, new headquarters will be opened on Oct. 1 in New York, Pittsburgh and Chicago, it is announced. Similar offices were established a few months ago at Atlanta, Dallas, Kansas City and San Francisco.

F. W. Berdan will manage the New York Division. He has been with the company since 1922 and has held executive positions since 1929, for the last several years in New York.

J. A. Hammond, who has been with National Carbon since 1923 as salesman and sales executive, will manage the Pittsburgh Division. He became District Manager of the former Carbon Products Division at Chicago in 1930, and since early last year has served at Cleveland as Assistant General Sales Manager of that Division.

Heading the Chicago Division will be H. A. Stewart, who has been with the company since 1919. He has worked continuously in Chicago, first as a salesman and later as a sales executive.

• METROPOLITAN OFFICE, HOUGHTON CO.

E. F. Houghton & Co. has announced that its office for the Metropolitan New York area, formerly located at 421 Seventh Ave., New York, N. Y., has been combined with its office and warehouse at 135 Hoboken Ave., Jersey City 2, N. J. The telephone number is Journal Square 2-7343. H. E. Sanson is general sales manager of the Eastern Division of the Houghton company.

• OPENS PHILADELPHIA BRANCH

Emery Industries, Inc., has announced the opening of a branch sales office and warehouse at 401 N. Broad Street, Philadelphia 8, Pa. M. Jay Veenstra will assume the responsibilities of district chemical sales manager on October 1st. Stocks will be maintained in Philadelphia for immediate shipments.

• HARDESTY APPOINTS ROWLEY

W. C. Hardesty Company announce the appointment of George A. Rowley Company, 937 No. Front Street, Philadelphia, as agents in the Philadelphia area to handle their line of fatty acids and their derivatives manufactured by them.

• JOINS ASA

The National Association of Wool Manufacturers has become an Associate Member of the American Standards Association, according to an announcement made recently. The NAWM, headed by Arthur Besse, has been cooperating with the ASA for a long time in the technical work of interest to its members. The wool manufacturers were represented on the committee that developed the textile Safety Code in 1929 and are at present taking part in work on a standard for fastness of color in textiles and on a project to set the principles underlying valid certification and labeling of commodities.

• TEXTBOOK ON NITROCELLULOSE

A basic textbook on the properties and uses of soluble nitrocellulose, base for plastics, lacquers, coated textiles and many other products, has been published by Hercules Powder Company's Cellulose Products Department.

Divided into two parts, the properties of nitrocellulose and its uses, this technical book is intended to be an aid to manufacturers already using nitrocellulose as well as to those who may find in nitrocellulose an answer to their problems.

Beginning with a discussion of the history of nitrocellulose, the book contains a section on properties which includes chapters on the manufacture, types, solubility, viscosity and other pertinent information on the unusual properties of nitrocellulose so useful in so many different industries.

The first section also contains six tables including one showing nitrogen and viscosity specifications of the 17 Hercules soluble nitrocellulose types, a nitrocellulose blending chart and twenty-two other charts and graphs.

The section on uses of nitrocellulose discusses its application in lacquers, coated textiles, plastics, adhesives and inks.

Nine tables in this section show the hardness of lacquer films, the results obtained from exposing lacquer panels to three and six months of weathering in Florida and exposure data on pigmented nitrocellulose lacquer panels after three years weathering in Wilmington, Del., the use of nitrocellulose in artificial leather and coated textiles and typical properties of nitrocellulose plastics.

A result of many years of research work by Hercules, the company believes this is the most complete compilation of technical information on soluble nitrocellulose available to industry.

• JOINS ALROSE CHEMICAL

The Alrose Chemical Co., Providence, R. I., announces the retention of Archie S. Stevenson as a representative of their Textile Products Division.

Mr. Stevenson has had wide and diversified print works experience. He was formerly associated with the U. S. Finishing Co., Glenlyon Print Works and Allied Textile Printers Inc.

• ELECTED VICE-PRESIDENT, STEIN, HALL

Stein, Hall & Co., Inc., New York, announces the election of Oliver H. Clapp as a vice-president. Mr. Clapp resigned as assistant vice-president in July, 1942, and joined the Defense Supplies Corp. in Washington. More recently he served as an executive of the Foreign Economic Administration.

OBITUARY

PHILIP H. STOTT

PHILIP HOWARD STOTT a chemist associated with the Technical Laboratory of the Dyestuffs Division, E. I. du Pont de Nemours & Company, died in the Deleware Hospital, Wilmington, Del., on Monday, August 28. He was 52 years old.

Mr. Stott was stricken with a heart attack while vacationing at Cape May, N. J. He had been in poor health for the past two years.

A native of Rochdale, England, he was employed by chemical concerns in Manchester and Stalybridge before coming to this country in 1916. In 1917 he joined the Newport Chemical Company at Milwaukee, Wis., as a research chemist and later was chief chemist in charge of that firm's technical sales laboratory at Passaic,

Philip H. Stott

N. J. When the Newport Company became part of the du Pont Company organization in 1931, he was assigned to the Technical Laboratory at Deepwater Point, N. J., and had served there since, becoming Division head in charge of the application of dyestuffs to rayon, nylon and other synthetic textile fibers.

He was a contributor to technical journals and on several occasions had delivered papers before the American Association of Textile Chemists and Colorists, of which association he was a senior member. He was a graduate of Victoria College at Manchester, England, and studied for two years in Germany.

Mr. Stott's home was at 176 East Avenue, Woodstown, N. J. His wife, Mrs. Bessie M. Stott, died about a year ago. There are no children.

CARL H. RUPPRECHT

CARL H. RUPPRECHT, general manager of the Pigments Department of E. I. du Pont de Nemours & Company, died September 10, at East Orange, N. J., after an illness of several months. He was 57 years old.

Mr. Rupprecht had been identified with the pigments and dry colors industry throughout his business life. A native New Yorker, he was first associated with the Fred L. Lavanburg Company in New York, manufacturers of dry colors, starting in the plant and becoming eventually assistant sales director. Later he spent three years as a salesman and assistant to the sales executive of George Lueders of New York, color manufacturer.

He joined the du Pont company on December 1, 1919, in the Lithopone, Dry Color & Pigments Division of the Sales Department in Chicago. He was appointed sales manager in Chicago in 1920, district sales manager in Chicago in 1921, and general sales manager in Wilmington on March 1, 1924. His offices were moved to Newark, N. J., later that year.

Du Pont acquired the Grasselli Chemical Company in 1928 and Mr. Rupprecht was transferred to Cleveland as sales manager of its Pigments Division in January, 1929. He became manager of what was then the du Pont Company Pigments Division in July, 1930, with headquarters at Newark.

In 1931, the titanium pigments business of the Commercial Pigments Corporation was consolidated with the lithopone and dry color interests of the du Pont company to form the Krebs Pigment and Color Corporation. Mr. Rupprecht was elected president and a director.

The Krebs Pigments Department was established in 1935, and he was named general manager. That department was re-named the Pigments Department as of January 1, 1943.

Mr. Rupprecht maintained his home at the Hotel Suburban in East Orange, N. J. He was unmarried. Two brothers survive.

• CLASSIFIED ADVERTISEMENTS •

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $6.25 per column inch or less per insertion.

WANTED: Salesman by a New Jersey Manufacturer of Boil-off compounds and textile finishes. Salary and commission. State qualifications and draft status. Box 576.

POSITION WANTED: Dyer, 33 years old, 14 years experience, cotton, rayon and acetate crepe piece goods. Draft exempt, can go anywhere. Box 587.

POSITION WANTED: Hosiery Dyer both technical and practical, with several years experience, capable of doing any hosiery dye job. Draft status 1-A-H. Box 592.

WANTED: Group Leader for Quality Control and Testing Laboratory sought by well known New England textile company. Salary commensurate with ability and experience. Give all pertinent information and enclose recent photograph. Box 596.

WANTED: Assistant dye house superintendent experienced in dyeing cotton, rayon, silk, both skein and package. Chemistry education and laboratory experience of primary importance. Must be able to supervise both dye house production and laboratory. Box 597.

WANTED: Chemist for southern laboratory of the textile division of a nationally known organization. Splendid opportunity, permanent. Give age, draft status, education, references, salary desired. Box 598.

WANTED: Large hosiery mill requires dye man capable of assuming full responsibility. Write full details regarding yourself, your experience, past and present, compensation, and give references. All communications confidential. Address letter to J. A. Goodman, President, National Hosiery Mills, Inc., Indianapolis, Indiana.

WANTED: A textile specialty manufacturer who desires representation in the middle west. Box 599.

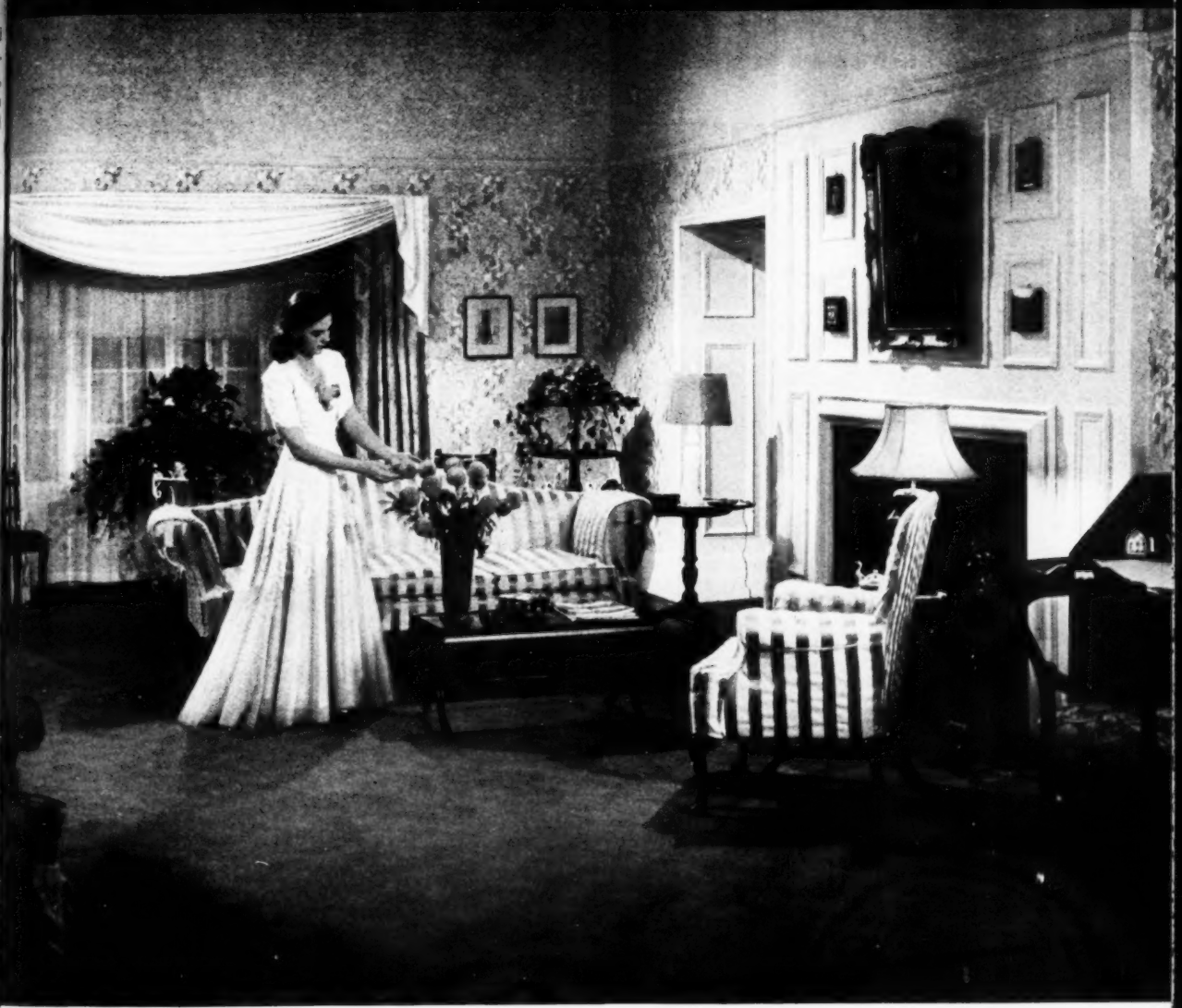
WANTED: Overseer for desize, scour, mercerize, boil off and tenter. Must be experienced, mechanically trained, willing worker and able to train help. Good salary and living conditions. Box 600.

POSITION WANTED: Chemist, dyer, and superintendent, fourteen years experience on cotton, rayons and wool, all types of colors, on package and piece goods machines. Desires position as head dyer or assistant to general plant manager. Textile school graduate. Box 601.

NOTE

Essential employees need release statement. Employees who are to be hired for critical occupations need release statement and U. S. E. S. consent.

SANDOZ PRESENTS *The color achievement of the month*



Room Personality BY MOHAWK MILLS

As her house reflects *her* personality ... so each individual room reflects, in style and decoration, the magic colors of Mohawk rugs.

We at Sandoz... proud to place at the service of the weaver our special ability to "think ahead with textiles" ... pay tribute this month to Mohawk Mills, the peacetime creators of so much warmth and color in so many American homes.

In helping mills like Mohawk to satisfy the exacting demands of their own high standards, Sandoz research chemists have developed a number of distinctive dyes and auxiliaries.

Xylene Light Yellow 2G, for instance. This famous type was originated by Sandoz in 1908, and still is the yellow component of most acid combination shades on wool whenever superior light fastness is required.

Other products of Sandoz research include Alizarine Light Blue 4GL Pat., now recognized as the fastest-to-light acid blue on the market ... also Azo Rubinole 3GP Pat. and Alizarine Light Violet 2RC, outstanding members of a complete line of fast-to-light acid colors.

To expedite *your* order, Sandoz application laboratories are maintained in New York, Boston, Philadelphia, Charlotte, Los Angeles and Toronto. Stocks in those cities cover a wide range of acid, chrome and direct dyes for all natural and synthetic fibres. Other Sandoz branches: in Chicago, Paterson and Providence.

Watch for the next "Color Achievement of the Month" featuring the work of another Sandoz customer among leaders of the textile industry.

SANDOZ CHEMICAL WORKS, INC., 61 VAN DAM STREET, NEW YORK 13, N. Y., U. S. A.

SANDOZ *thinks ahead with textiles*

SANDOZ

LIVELIER...CLEANER...BRIGHTER

WOOLENS WITH "MODINAL"* D

DON'T BE penny-wise and yard-foolish in finishing your woolen and worsted piece goods. Use "Modinal" D to give them clarity, brightness and resiliency.

"Modinal" speeds finishing. It aids in rinsing the last trace of soap from the scoured wool. It minimizes metallic and other insoluble soap deposits which may blotch woolens during piece dyeing. It eliminates odor following dry finishing.

Let "Modinal" D speed and improve your wartime production. Gardinol Corp., General Offices, Wilmington, Delaware. Sales Agents: Procter & Gamble, Cincinnati, Ohio. E. I. du Pont de Nemours & Co. (Inc.), Wilmington, Delaware.

*"MODINAL" *is the trade mark used by the Gardinol Corporation to designate a group of its fatty alcohol sulfates.*

MODINAL D ***Fatty Alcohol Sulfates***

TEXTILE PRINTING *Gums*

KOVAT — A cold water swelling gum for vat and discharge printing was developed by National's application research in close collaboration with the textile industry.

KOVAT is a definite challenge to all types of cook-up gums.

KOVAT saves time. It uses cold water. And it mixes in a matter of minutes. *Cook-up gums require 3-4 hours.*

KOVAT saves labor and equipment. It uses a simple tank or barrel and a portable mixer. *Cook-up gums require a steam-jacketed kettle.*

KOVAT saves storage space. Small batches are mixed fresh as needed. *Cook-up gums require storage facilities for each new necessarily large batch.*

KOVAT isn't a brash, untried newcomer. It's the result of painstaking laboratory and application research. It has proved itself in commercial use by doing a better printing job with lower solids, less gum. Full information is available — NOW!

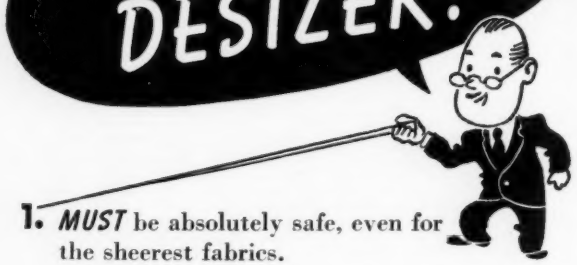
Offices: 270 Madison Avenue, New York 16; Boston, Philadelphia, Chicago, Indianapolis, San Francisco, and other principal cities.

National also produces:
AZO GUM for Rapidogen, Indigosol and Napthol colors; VAT GUM 36 for vat colors on cotton and rayon;
RESYN UF for crease-proof, shrink-proof, and permanent finishes;
AMBERTEX for discharge and direct printing;
FIBERTEX for sheer crisp finishes.

National STARCH products

STARCHES—AND SPECIALTIES WITH EASILY DEMONSTRATED SUPERIORITY

5 MUSTS FOR A PERFECT DESIZER!



1. ***MUST*** be absolutely safe, even for the sheerest fabrics.

EXSIZE is a concentration of natural enzymes—contains no harsh alkalis or chemicals—its gentle, thorough action cannot weaken cloth.

2. ***MUST*** work evenly and rapidly.

EXSIZE desizes starch and starch derivative sized fibres with speed and efficiency, leaving materials soft, elastic and supple.

3. ***MUST*** be simple to prepare and use.

EXSIZE can be used by anyone successfully; easy to use; no elaborate preparation required.

4. ***MUST*** produce uniform results.

EXSIZE never does a spotty job—it turns out the same clean absorbent fabrics every day.

5. ***MUST*** be economical.

EXSIZE costs less than most desizing agents. It gives maximum satisfaction at minimum expense. A few cents worth will desize hundreds of yards of cotton or mixed cotton cloth.

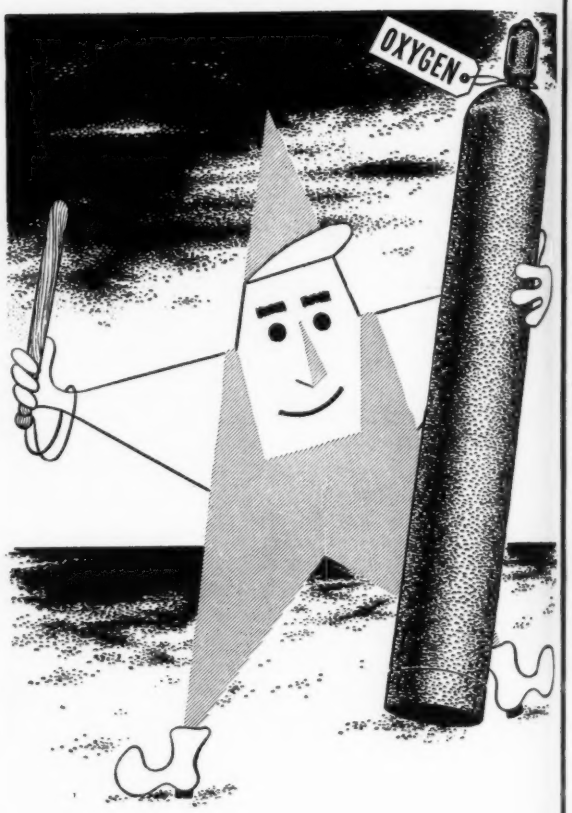
Use our laboratories for your tests—there's no obligation. Or, if you prefer, a trained Pabst field man will gladly work with you in your own mill. Write for our free booklet.

Copr. 1944, Pabst Brewing Company, Milwaukee, Wisc.

PABST SALES COMPANY

CHICAGO, ILLINOIS

Warehouses at New York, and Textile Warehouse Company, Greenville, S. C.



safe convoy for oxygen

By its dependable uniform stability, Star Silicate allows the even release of the oxygen from the peroxide—not too rapid decomposition to be wasteful, nor too slow to be ineffectual. The advantage is two-fold: whiter, first quality cloth and improved peroxide mileage.

Star Silicate has the right alkalinity to control the decomposition of the bleach, and its purity offers protection against damaging precipitations.

Be safe—specify Star Brand for all your bleaching baths.

PHILADELPHIA QUARTZ CO.

Dept. B, 127 S. Third St., Phila. 6
Distributors in over 65 cities

star BRAND

P Q SILICATES OF SODA

WANT *Uniform, Controlled* FABRIC SHRINKAGE?

Most fabrics set to a residual shrinkage of less than 2%... without special equipment... by—

QUAKER DIAPENE "U"

Why let fabric shrinkage rob you of valuable yardage, when 50% to 75% of this processing loss can usually be prevented by finishing with QUAKER DIAPENE "U"?

This water-white, semi-viscous resin actually sets fabrics against shrinkage (less than 2% residual in most cases). Result: substantially less loss of yardage when fabrics are subjected to pre-shrinking processes as the final treatment. Goods finished with DIAPENE "U" may be pre-shrunk at much higher speeds than those not so finished.

DIAPENE "U" is a special polymer containing no excess, unreacted chemicals. Thus, costly sodium perborate after-washing and drying usually are eliminated.

DIAPENE "U" is a permanent finish, easily applied with equipment normally available in most finishing plants. Results are remarkably *uniform!*

A Quaker Process Engineer will gladly discuss with you the time- and money-saving possibilities of DIAPENE "U" for the finishing of your fabrics. There's no obligation, of course. Simply use the handy request form provided below for your convenience.

QUAKER CHEMICAL PRODUCTS CORP.

CONSHOHOCKEN, PA.

Other Plants in CHICAGO and DETROIT Warehouse Stocks in Principal Industrial Centers

For more information on DIAPENE "U" fill in below, tear out and mail.

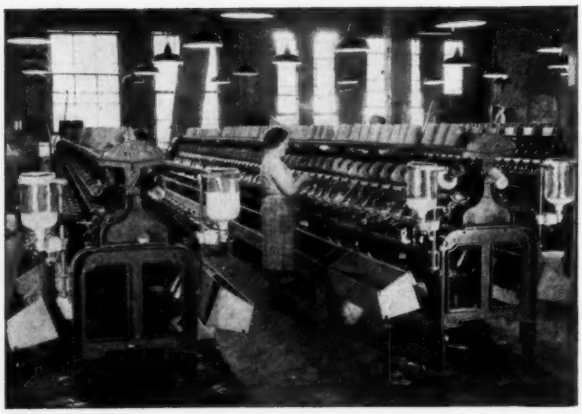
A Progressive Organization of Research and Process Engineers and Manufacturing Chemists

Name_____ Position_____

...PLEASE PRINT COMPANY NAME AND ADDRESS IN MARGIN BELOW...

SOFTER, BETTER KNITTING COTTON YARNS—DYED OR BLEACHED—

with Laurel Emulsions



Laurel Emulsions—Hydrocop and 3B Softener...condition and soften cotton yarns, mercerized, dyed or bleached. Used by hundreds of mills for over 25 years to assure proper regain, speed up twist, produce even-running yarns and clearer stitch. Laurel Hydrocop and 3B Softener will not turn rancid or discolor yarn on standing. Easily applied over roller trough or cone winders, quilling frames, or twisters. If you want softer, better knitting yarns to help you meet specifications, send for a trial order of these veteran emulsions, Laurel Hydrocop and 3B Softener today.

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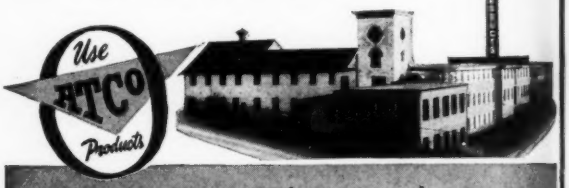

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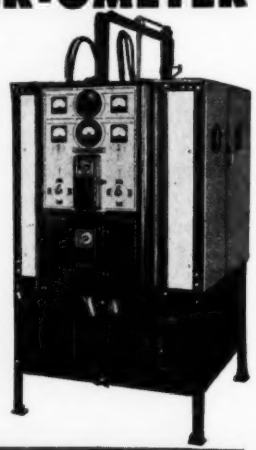

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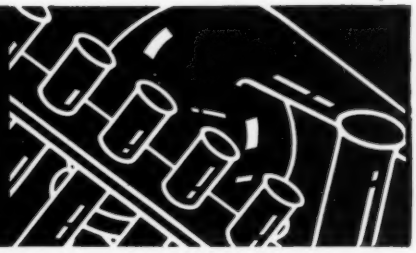

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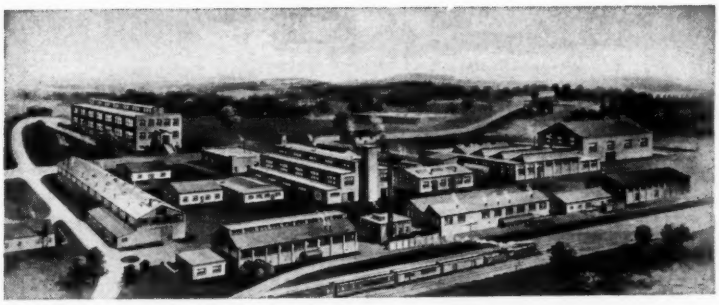

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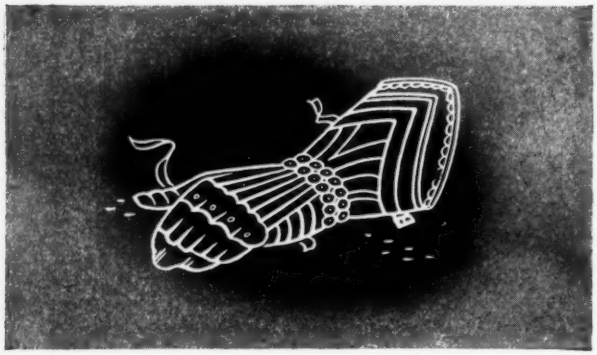

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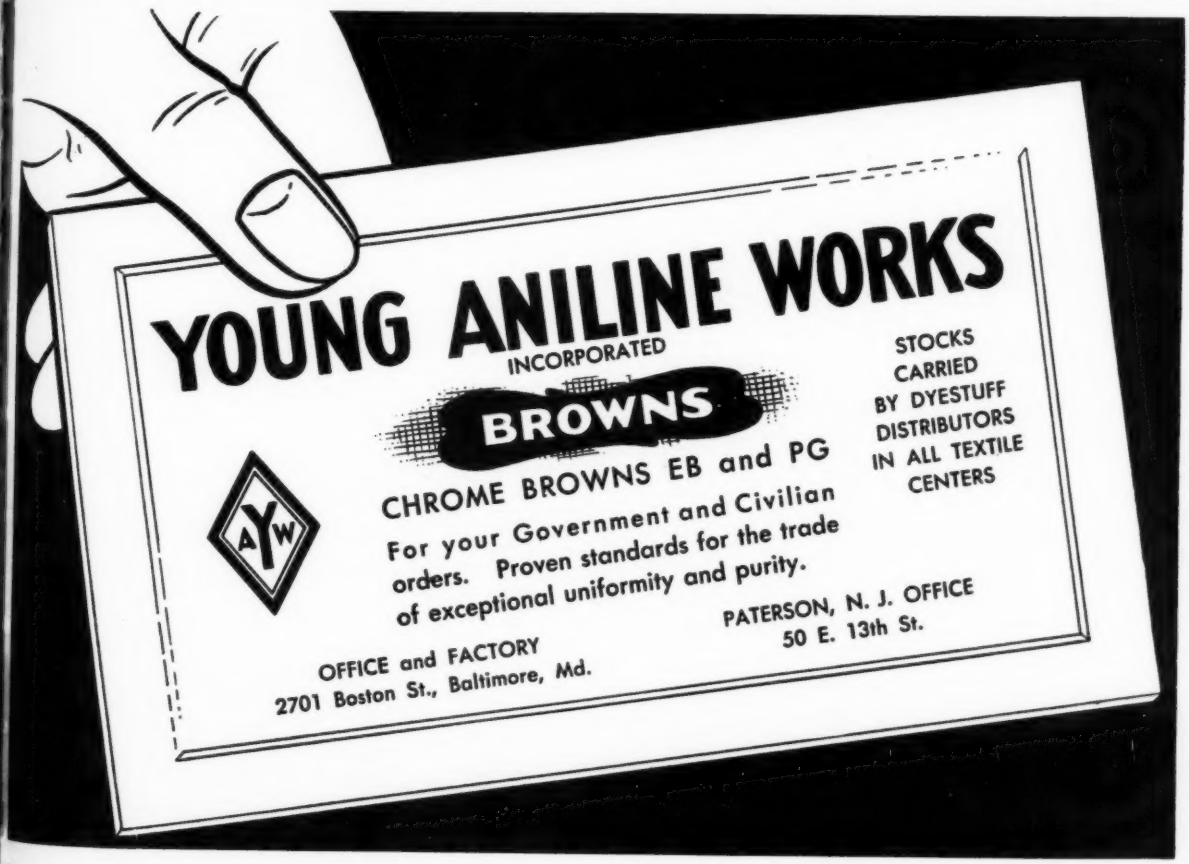
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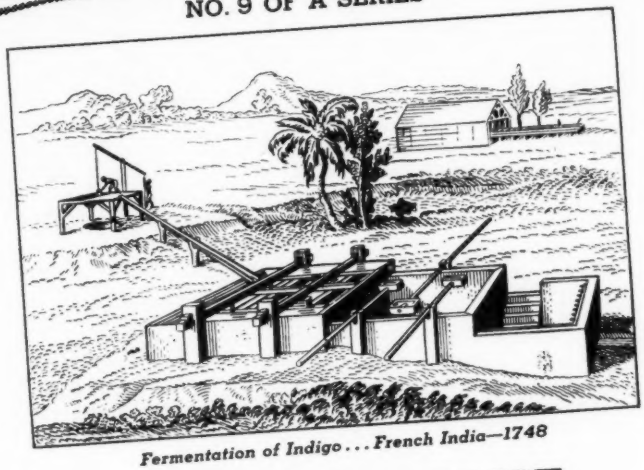

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